πr^2

Student ID: 201467380

Student Name: Saleh Al-hawa

Serial Number: ~~#~~ 27

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

---

① $\frac{dy}{dt} = 4$ cm/s

$\frac{dx}{dt}$ = unknown

Point $(2,3)$

$y = \sqrt{1+x^3}$

$\frac{dy}{dt} = \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 \cdot \frac{dx}{dt}$

$4 = \frac{1}{2\sqrt{1+8}} \cdot 3(4) \cdot \frac{dx}{dt}$

$12 \overline{)24}$ 2, 24

$6\,(0.03)$

$.18$

$4 = \frac{12\frac{dx}{dt}}{6} \Rightarrow 12\frac{dx}{dt} = 24 \Rightarrow \frac{dx}{dt} = \cancel{\frac{24}{12}} = 2$

② $\Delta r = 0.03$ m which is equal to dr

$r = 3$ m

$dy = f'(x) \cdot dx$

Area $= \pi r^2$

$\frac{dA}{dt} = 2\pi r \frac{\Delta r}{\Delta t}$

$\frac{dA}{dt} = 2\pi(3)(0.03) =$

$= 0.18\,(\pi)$

③ $\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right) = \frac{1}{1 \cancel{+} (\sin x^2)^2} \cdot 2\cos x^2$

$\cos^2 + \sin^2 = 1$

$\sin^2 = 1 - \cos^2 x$

$= \frac{2\cos x^2}{1 - (\sin x^2)^2} = \frac{2\cos x^2}{1 - \sin^2 x^4} = \frac{2\cos x^2}{1 - 1 - \cos^2 x^4} = \frac{2\cos x^2}{-\cos^2 x^4}$

Student ID: 201443240

Student Name: [illegible]

Serial Number: 13

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find
$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$
Simplify your answer.

① $f(x) = \sqrt{1+x^3}$, $f'(x) = \frac{1}{2\sqrt{1+x^3}}$

$\frac{dy}{dt} = 4$ cm/s , $x = 2$, $y = 3$, $\frac{dx}{dt} = ??$

$x^2 + y^2 = 5$

$= 2x \cdot \frac{dx}{dt} + 2y \cdot \frac{dy}{dt} = 0$

$= x \cdot \frac{dx}{dt} + y \cdot \frac{dy}{dt} = 0$

$= x \cdot \frac{dx}{dt} = -y \cdot \frac{dy}{dt}$

$= \frac{dx}{dt} = -\frac{y}{x} \cdot \frac{dy}{dt} = -\frac{3}{2} \cdot (4)$

$= -6$ cm/s

(2) $A = \pi r^2$, $r = 3m$, $dr = 0.03m$

$dA = 2\pi r \cdot dr$

$\boxed{L(x) \approx f(a) + dy}$

$dA = 2\pi(3) \cdot (0.03)$

$= 6\pi(0.03)$

$= 6\pi\left(\frac{3}{100}\right) = \frac{9\pi}{50}$

Relativ error $= \frac{df}{f}$

$= \frac{2\cancel{\pi r}}{\cancel{\pi r^2}} \cdot dr = 2 \cdot \frac{dr}{r} = 2 \cdot \left(\frac{0.03}{3}\right)$

$= 2\left(\frac{3}{300}\right)$

$= \frac{6}{300} = \frac{2}{100} = 0.02m$

---

(3) $\coth^{-1}(\sin x^2)$

$= \left(\frac{1}{1-(\sin x^2)^2}\right) \cdot (\cos x^2) \cdot (2x)$

$= \frac{2x \cos x^2}{1-(\sin x^2)^2}$

$= \frac{2x(\sin x^2 - 1)}{1-(\sin x^2)^2}$

$\coth^{-1}$

$= \frac{1}{1-x^2}$

cos

$\sin x^2 - \cos x^2 = 1$

$\cos x^2 = \sin x^2 - 1$

$\sin x^2 = (1 + \cos x^2)^2$

$1 + 2\cos x^2 + \cos x^4$

Student ID: 201443800

Student Name: Sultan Alshahrani.

Serial Number: 14

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

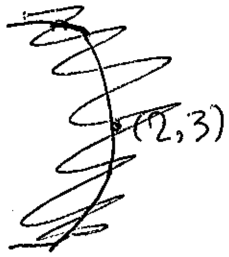
2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

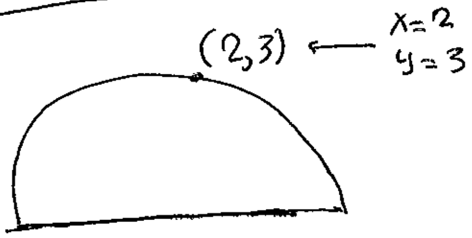
$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

①



$\boxed{\frac{dy}{dt} = 4\,cm/s}$, $y = 3$.



$\boxed{y = \sqrt{1+x^3}}$

$\boxed{\frac{dy}{dt} = 4\,cm/s}$

$\frac{dx}{dt} = ?$

$\frac{dy}{dt} = \frac{1}{2}(1+x^3)^{-\frac{1}{2}} \cdot 3x^2 \frac{dx}{dt}$

$$\frac{\frac{dy}{dt}}{\frac{3x^2}{2\sqrt{1+x^3}}} = \frac{dx}{dt}$$

$$\frac{dy}{dt} \cdot \frac{2\sqrt{1+x^3}}{3x^2} = \frac{dx}{dt}$$

$$4 \cdot \frac{6}{12} = \frac{dx}{dt}$$

$\boxed{\text{So, } \frac{dx}{dt} = 2\,cm/s.}$

② $\boxed{r = 3,\ \frac{dr}{dt} = 0.03}$

$A = \pi r^2 \rightarrow \frac{dA}{dt} = 2\pi r \frac{dr}{dt}$

$\frac{dA}{dt} = 2\pi(3)(0.03)$

$= \boxed{0.18\pi}$

$\frac{2\pi r \frac{dA}{dt}}{\pi r^2} = \frac{2}{r} \cdot \boxed{\frac{dr}{dt}} = \frac{2}{3} \cdot 0.03$

$\boxed{0.03\,m} \rightarrow \boxed{3\,cm}$

$= \frac{2}{3} \cdot 0.03 = \frac{0.06}{3}$

$0.03 \times 2 = 0.06$

$\text{Relative} = \frac{\Delta A}{A} = \frac{dA}{A} = \frac{2\pi r \frac{dr}{dt}}{\pi r^2} = \frac{(2)(0.03)}{3}$

$=$

③ $\frac{1}{1-\sin^2 x^2} \cdot \cos(x^2) \cdot 2x$

$$\frac{2x\cos x^2}{1-\sin^2 x^2} = 2x \cdot \frac{\cos x^2}{\cos x^2} = \boxed{2x}$$

①

$\sin^2 x + \cos^2 x = 1$

Student ID: 201436940

Student Name: Abdulmajeed Albal

Serial Number: 9

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

① $\frac{dy}{dt} = 4$ $\quad x = 2$, $y = 3$

$\frac{dx}{dt} = ?$

$y = \sqrt{1 + x^3}$

$y' = \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 \cdot \frac{dx}{dt}$

$4 = \frac{1}{6} \cdot 12 \cdot \frac{dx}{dt}$

$\frac{dx}{dt} = \frac{4 \cdot 6}{12} = \frac{24}{12} \boxed{= 2 \text{ cm/s}}$

③ $\frac{d}{dx}(\coth^{-1}(\sin x^2)) = \frac{1}{1-\sin^2 x^2} \cdot \cos x^2$

$= \frac{\cos x^2}{1-\sin^2 x^2} = \frac{\cancel{\cos(x^2)}}{\cos^2(x^2)}$

$= \frac{1}{\cos(x^2)} \boxed{= \sec(x^2)}$

② $r = 3$ m $\quad r =$ radius

P Error $= 0.03$ m

$A =$ area

$A = \frac{1}{2}\pi r^2$

relative error $\boxed{= 0.02}$

Student ID: Badr Elmokayed

Student Name: 201467920

Serial Number: 28

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

$y = \sqrt{1+x^3}$

$\frac{dy}{dt} = \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 \cdot \frac{dx}{dt}$

$\frac{dy}{dt} = \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 \cdot \frac{dx}{dt}$

$4 = \frac{1}{2\sqrt{1+(2)^3}} \cdot 3(2)^2 \cdot \frac{dx}{dt}$

$4 = \frac{1}{\cancel{6}} \cdot \cancel{12}^{2} \frac{dx}{dt}$

$4 = 2\frac{dx}{dt}$

$\boxed{\frac{dx}{dt} = 2 \text{ cm/s}}$

Q2) $r = 3$ m $\quad A = \pi r^2$

$dr = 0.03$ m

Sol.

$dy = f'(x)\,dx$

$A = \pi r^2$

$dA = 2\pi r\,dr$

$dA = 6\pi(0.03)$

$dA = 0.18$

relative error $= \frac{dA}{A} = \frac{2\pi r\,dr}{\pi r^2} = \frac{2dr}{r} = \frac{2(0.03)}{3}$

$\boxed{= 0.02}$

Q3)

Sol

$\frac{1}{1-(\sin x^2)^2} \cdot 2x\cos(x^2)$

$= \frac{2x\cos(x^2)}{1-(\sin(x^2))^2}$

$\sin^2_x + \cos^2_x = 1 \Rightarrow 1-\sin^2_x = \cos^2_x$

$= \frac{2x\,\cancel{\cos(x^2)}}{(\cos x^2)^{\cancel{2}}}$

$= \frac{2x}{\cos(x^2)}$

Student ID: 20143454

Student Name: mohammed

Serial Number: 6

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

①

$f(x) = \sqrt{1+x^3}$ Point $(2,3)$ $f'(x) = \frac{1}{2\sqrt{1+x^3}}$

rate = 4

$y' = \frac{12}{6}\frac{dx}{dr}$

$4 = \frac{dx}{dr}\frac{2}{\ }$

$2 = \frac{dx}{dr}$

③

$\frac{d}{dx} = \left[\coth^{-1}(\sin x^2)\right]$

$\Rightarrow \frac{d}{dx}\cot h^{-1}x = \frac{1}{1+x^2}$

$\frac{d}{dx}\left[\cot h^{-1}(\sin x^2)\right] = \frac{1}{1+\sin^2 x^2}$

$= \frac{1}{\cos x^2}$

②

$r = 3$

error $= 0.03$

$= \frac{3}{100}$

Area $= \pi r^2$

$dy = 2\pi r \frac{dr}{dt}$

$dy = 6\pi \frac{dr}{dt}$

$dy = 6\pi \frac{3}{100}$

$dy = 0.18\pi$

Student ID: 201463900

Student Name: Nawaf saleh alharaq

Serial Number: 26

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

πr^2 / $r = 3m$ /

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

1)

$f(x) = \sqrt{1+x^3}$, $\begin{matrix} x & y \\ (2, & 3) \end{matrix}$

$\frac{dy}{dt} = 4$ / $\frac{dx}{dt} = ?$

$\frac{dy}{dt} = \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 \cdot \frac{dx}{dt}$

$4 = \frac{1}{2\cancel{\sqrt{1+(2)^3}}_{3}} \cdot 3(2)^2 \cdot \frac{dx}{dt}$

$4 = \frac{1}{\cancel{6}} \cdot \cancel{12}^{2} \cdot \frac{dx}{dt}$

$\frac{2dx}{dt} = \frac{4}{\cancel{2}}$ $\boxed{\frac{dx}{dt} = 2}$

2) relative Error $= \frac{dy}{\Delta y}$ (2)

$dy = 2\pi r$

$\frac{6\pi}{0.03}$ $\frac{3}{100}$

$\frac{200\pi}{\frac{\cancel{600}\pi}{\cancel{3}}}$

$= 200\pi$

(3)

$\coth^{-1} = \frac{1}{-1+x^2}$

$\frac{1}{-1+(\sin x^2)^2} \cdot 2\sin x \cdot \cos x$

$\frac{2\sin x \cancel{\cos x}}{\cancel{-1(1+\sin x^2)}\cos^{\cancel{4}} x}$ $\frac{2\sin x}{\cos^3 x}$

$= 2\tan x \sec^2 x$

$\sin^2\alpha + \cos^2\alpha = 1$

$(1-\sin^2\alpha)(1+\sin^2\alpha)$

$\cos^2\alpha - \sin^2\alpha$

$(1-\sin^2\alpha) -$

$\frac{\sin^2 x + \cos^2 x = 1}{\cos}$

$\coth y = x$

$\tan^2 x + 1 = \sec^2$

$\sqrt{1+x^2}$

x

$-1 + \sin^2\alpha = 1\cos^2\alpha$

Student ID: 201450600

Student Name: Alhazmi Ahmed

Serial Number: 23

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

$(1+x^3)^{\frac{1}{2}}$

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

πr^2

3. (3 pts) Find
$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$
Simplify your answer.

1) $y' = \frac{1}{2}\frac{1}{\sqrt{1+x^3}} \cdot 3x^2 \Rightarrow 4 = \frac{3x^2}{2\sqrt{1+x^3}} \Rightarrow 8\sqrt{1+x^3} = 3x^2$

$64 \cdot (1+x^2) = 9x^4$

2) $\Delta y = f'(x)\,dx$

3) $\coth^{-1}(\sin x^2) \Rightarrow \frac{1}{1-(\sin x^2)^2} \cdot \cos x^2 \cdot 2x$

$= \frac{2x\cos x^2}{1-(\sin x^2)^2} = \frac{2x\cos x^2}{(\cos x^2)^2} = \frac{2x}{\cos x^2}$

Student ID: 201445760

Student Name: Mustafa Al Khawaldeh

Serial Number: 15

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

$x = 2$
$y = 3$

$\frac{dy}{dt} = 4$

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

$\frac{1}{1-x^2}$

Simplify your answer.

$$\frac{dy}{dt} = \frac{3x^2 \frac{dy}{dt}}{2\sqrt{1+x^3}}$$

$$\cancel{4} = \frac{\cancel{3}(4)\frac{dx}{dt}}{(2)\cancel{3}}$$

$$2 = \frac{dx}{dt}$$

$$\frac{dx}{dt} = 2 \text{ cm/s}$$

2) $r = 3m$, $dr = 0.03m$

$A = \pi r^2$

$dA = 2\pi r (dA)$

$$dA \quad 2\pi(3)\left(\frac{3}{100}\right) = \frac{18\pi}{100}$$

$$\frac{dA}{A} = \frac{\frac{\cancel{18}\pi}{100}}{\cancel{9}\pi} = \frac{2}{100} = 0.02$$

3) $$\frac{2x\cos x^2}{1-(\sin x^2)^2} = \frac{2x\,\cancel{\cos x^2}}{(\cos x^2)^2}$$

$$= \frac{2x}{\cos x^2}$$

Student ID: 201447860

Student Name: Khalid AlQahtani

Serial Number: 18

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

① $$\frac{dy}{dt} = \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 \frac{dx}{dt}$$

$$\frac{dy}{dt} = \frac{3x^2 \frac{dx}{dt}}{2\sqrt{1+x^3}}$$

$$4 = \frac{3(2)^2 \frac{dx}{dt}}{2\sqrt{1+(2)^3}}$$

$$4 = \frac{12 \frac{dx}{dt}}{2\sqrt{9}}$$

$$12 \frac{dx}{dt} = 4 \cdot 6$$

$$\frac{dx}{dt} = \frac{24}{12} = 2 \text{ cm/s}$$

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

③ $$f'(x) = \frac{1}{1 - (\sin x^2)^2} \cdot \cos(x^2) \cdot 2x$$

$$= \frac{2x \cos x^2}{1 - \sin^2 x^2}$$

$$= \frac{2x \cos x^2}{\cos^2 x^2}$$

$$= \frac{2x}{\cos x^2}.$$

$\cot y = \cot^{-1} x$

$\cos^2 + \sin^2 = 1$

Student ID: 201548840

Student Name: Abdullah Alsaad Khan

Serial Number: 35

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

① $y = \sqrt{1+x^3}$

$\overset{x}{(2,}\ \overset{y}{3)}$

$\frac{dy}{dt} = \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 \cdot \frac{dx}{dt}$

$\frac{dy}{dt} = 4$ cm/s

$\frac{dx}{dt} = ?$

$4 = \frac{1}{2\sqrt{1+2^3}} \cdot 3(2)^2 \cdot \frac{dx}{dt}$

$4 = \frac{1}{6} \cdot 12 \cdot \frac{dx}{dt}$

$4 = 2\frac{dx}{dt}$

$\frac{dx}{dt} = 2$ cm/s

③

$\frac{1}{1-x^2}$

$= \frac{1}{1-(\sin(x^2))^2} \cdot \cos(x^2) \cdot 2x$

$= \frac{2x\cos(x^2)}{1-(\sin(x^2))^2}$

Simplify

$= \frac{2x\cos x^2}{\cos(x^2)^2}$

$= \frac{2x}{\cos(x^2)}$

② Area $= \pi r^2$

$r = 3$m

$\frac{dA}{dt} = 2\pi r \cdot \frac{dr}{dt}$

$\frac{dA}{dt} = 2\pi(3) \cdot (0.03)$

$\frac{dA}{dt} = 6\pi \cdot (0.03)$

$= \frac{9\pi}{50}$

relative error $= 0.02$ m^2

Student ID: 201450460

Student Name: Abdullah Shgdar

Serial Number: 22

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1 + x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of $\boxed{4 \text{ cm/s.}}$ At this instant, what is ~~the rate at which the~~ x-coordinate is changing?

$\frac{dy}{dt}$ $\frac{dx}{dt}$

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

r Δr

$A = \pi r^2$

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

1)

$$y\frac{dy}{dt} = \frac{1}{2(1+x^3)} \cdot 3x^2\frac{dx}{dt}$$

$$(3)(4) = \frac{1}{2(1+2^3)} \cdot 3(2^2)\frac{dx}{dt}$$

$$\cancel{12} = \frac{1}{18} \cdot \cancel{12}\frac{dx}{dt}$$

$$\frac{dx}{dt} = 18 \text{ cm/s}$$

2)

$$f(x) = A = \pi r^2, \quad \Delta r = 0{,}03$$
$$r = 3$$

$$f'(x) = A' = 2\pi r$$

$$L(x) = f(x) - f'(x)(x - a)$$

3)

$$\frac{d}{dx}\coth^{-1}(\sin x^2) \cdot \frac{d}{dx}\sin x^2 \cdot \frac{d}{dx}x^2$$

$$\frac{d}{dx}\coth^{-1}(\sin x^2) \cdot (\cos x^2) \cdot (2x)$$

Student ID: 201434160

Student Name: Abdurhman Khosafi

Serial Number: 05

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

$\frac{dr}{r}$

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

$\frac{dy}{dt} = 4$ cm/s

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

r

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

$\frac{dr}{r} = 0.03$

---

(1)

$$y = \sqrt{1+x^3}$$

$$\frac{dy}{dt} = \frac{1}{2} \cdot \frac{1}{\sqrt{1+x^3}} \cdot \frac{dx}{dt}$$

$$4 = \frac{1}{2\sqrt{1+x^3}} \cdot \frac{dx}{dt}$$

$$\frac{dx}{dt} = \frac{4}{\frac{1}{2\sqrt{1+x^3}}} = 8\sqrt{1+x^3}$$

$$= 8\sqrt{1+8} = 24 \text{ cm/s}$$

(2) $A = \pi r^2$

$$\frac{dA}{dr} = 2\pi r \; dr$$

$$\boxed{dA = 6\pi \; dr}$$

$$\frac{dr}{r} = 0.03$$

$$\frac{dr}{3} = 0.03$$

$$\boxed{dr = 0.09}$$

$$dA = 0.09(6\pi)$$

$$= \frac{0.09}{0.03} = 3$$

(8) $\frac{d}{dx} \coth^{-1}(\sin x^2)$

$$\frac{d}{dx} \coth^{-1} = -\frac{1}{\sqrt{x^2+1}} \cdot \cos x^2 \cdot 2x$$

$$= -\frac{\cos x^2 \cdot 2x}{\sqrt{\sin^2 x^2 + 1}}$$

c.f

$$\coth^{-1} x = \frac{1}{\sqrt{x^2+1}} \quad \frac{1}{\sqrt{(\sin x^2)^2+1}} = \frac{1}{\sqrt{\sin^2 x^2 + 1}}$$

$(\sin x^2)$

☆ $\boxed{\tanh^{-1} x = \frac{1}{2}\ln \frac{x+1}{x-1}}$

$\tanh^{-1} \sin x^2$

Student ID: 201475720

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Student Name: Omar Elsharkawi

Serial Number: 31

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

1

$$\frac{dy}{dt} = \frac{1}{2}(1+x^3)^{-1/2} \cdot 3x^2 \frac{dx}{dt}$$

$$4 = \frac{1}{2}(1+8)^{-1/2} \cdot 12 \cdot \frac{dx}{dt}$$

$$4 = \frac{1}{2} \cdot \frac{1}{3} \cdot 12 \cdot \frac{dx}{dt}$$

$$4 = 2\frac{dx}{dt}$$

$$\boxed{\frac{dx}{dt} = 2}$$

So the rate at which X-Coordinat is Changing is $\boxed{2 \text{ (cm/s)}}$

2

$r = 3$

$\Delta r = dr = 0.03$

answer:

$A = \pi r^2$

$dA = 2\pi r\, dr$

$dA = 2\pi(3)(0.03)$

$\boxed{dA = 0.18\pi}$

the error in Area $= 0.18\pi$

$A = 9\pi$

$dA = 0.18\pi$

Percentage $= \frac{0.18\pi}{9\pi} = \frac{0.18}{9} = 0.02$

$= \boxed{2\%}$

③ $\frac{d}{dx} \operatorname{Coth}^{-1}(x) = \frac{1}{1-x^2}$

$f(x) = \operatorname{Coth}^{-1}(x)$

$g(x) = \sin x^2$

$$\frac{d}{dx} f(g(x)) = f'(g(x)) \cdot g'(x)$$

$$= \frac{1}{1-(\sin x^2)^2} \cdot 2x\cos x^2$$

$$= \frac{1}{\cos^2 x^2} \cdot 2x\cos x^2$$

$$= \frac{2x\cos x^2}{\cos x^2 \cdot \cos x^2}$$

$$= \frac{2x}{\cos x^2}$$

$\cos^2 + \sin^2 = 1$ $\frac{7}{100} \times \frac{1}{7}$

$$\frac{d}{dx}\coth^{-1}(x) = \frac{1}{1-x^2}$$

Student ID: Munzir Ahmed

Student Name: 201474300

Serial Number: 30

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

1

$$\frac{dy}{dt} = \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 \cdot \frac{dx}{dt}$$

$$4 = \frac{1}{2\sqrt{1+2^3}} \cdot 12 \cdot \frac{dx}{dt}$$

$$\frac{dx}{dt} = \frac{2\sqrt{1+2^3}}{3} = 2 \text{ cm/s}$$

2

$$A = \pi r^2$$

$$dA = \pi 2r\, dr$$

$$dA = \pi 2(3)(0.03)$$

$$\frac{dA}{A} = \frac{6\pi(0.03)}{9\pi}$$

$$= \frac{2(0.03)}{3} = 0.02 \text{ m}^2$$

3

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right)$$

$$= \frac{1}{1-(\sin x^2)^2} \cdot \cos x^2 \cdot 2x$$

$$= \frac{1}{\cos^2 x^2} \cdot \cos x^2 \cdot 2x$$

$$= \frac{1}{\cos x^2} \cdot 2x$$

$$= \frac{2x}{\cos x^2}$$

$$= 2x \sec x^2$$

$$\begin{array}{r} 0.03 \\ 2 \\ \hline 0.06 \end{array}$$

Student ID: 201431540

Student Name: Alsubhi, Ahmed

Serial Number: 4

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

$y = 3$, $x = 2$. $\frac{dy}{dt} = 4$ $\frac{dx}{dt} = ?!$

$y^2 = 1 + x^3$ → we will use this equation that has relation between x and y.

$$2y\frac{dy}{dt} = 3x^2\frac{dx}{dt}$$

$$\to 2(3)(4) = 3(2)^2\frac{dx}{dt}$$

$$24 = 3\times 4\frac{dx}{dt}$$

$$24 = 12\frac{dx}{dt} \Longrightarrow \frac{dx}{dt} = \frac{24}{12}$$

$\frac{dx}{dt} = 2$ so, x-coordinate is increasing at a rate of 2 cm/s.

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

② $A = \pi r^2$

$dA = 2\pi r\,dr$

relative errors $\frac{dA}{A}$

$$= \frac{2\cancel{\pi}\cancel{r}\,dr}{\cancel{\pi}r^2} = \frac{2\,dr}{r}$$

$$= \frac{2(0.03)}{(3)} = \frac{0.06}{3} = 0.02$$

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right)$$

$\coth^{-1} = \frac{1}{1 - x^2}$ → use this function.

$$\frac{1}{1-(\sin x^2)^2}\cdot(\sin x^2)'$$

$$\frac{\cos x^2\cdot(x^2)'}{1-(\sin x^2)^2} = \frac{2x\cos x^2}{1-(\sin x^2)^2}$$

$$= \frac{2x\,\cancel{\cos x^2}}{(\cos x^2)^{\cancel{2}}} = \frac{2x}{\cos x^2}$$

Student ID: 201436120

Student Name: Alajmi, Rayan

Serial Number: 8

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find
$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$
Simplify your answer.

1) $y = \sqrt{1+x^3}$

$\frac{dy}{dt} = \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 \frac{dx}{dt}$

$4 = \frac{3(2)^2 \frac{dx}{dt}}{2\sqrt{9}}$

$4 = \frac{12 \frac{dx}{dt}}{6}$

$24 = 12 \frac{dx}{dt}$

$\boxed{\frac{dx}{dt} = 2 \text{ cm/s}}$

2) $dy = f'(x)\,dx$

$\cancel{f(x+\Delta x)} - \cancel{f(x)}$

$A = \pi r^2$

$\frac{dA}{A} = 2\pi r \quad dr = 0.03 \quad r = 3$

$2\pi r = r(dr)$

$\frac{dA}{A} = 3(0.03)$

$= 0.09$

3) $\frac{d}{dx} \frac{1}{1-x^2}$

$\frac{1}{1-(\sin x^2)^2} \Rightarrow \frac{1}{1-\sin x^4} \Rightarrow \frac{-(-\cos x^4)(4x^3)}{(1-\sin x^4)^2} \Rightarrow \frac{4x^3 \cos x^4}{(1-\sin x^4)^2}$

$\frac{4x^3 \cancel{\cos x^4}}{(\cos x^4)^2} \Rightarrow \boxed{\frac{4x^3}{\cos x^4}}$

Student ID: 201446900

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Student Name: Hassan Alabdrabalnabi

Serial Number: 16

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

① $\frac{dy}{dt} = 4$ cm/s $y = \sqrt{1+x^3}$

unknown

② $A = \pi r^2$ $r = 3$

$f(a+dx) \approx fa + dy$

③ $\frac{d}{dx}\sin x^2 = \cos x^2 \cdot 2x$

$\frac{d}{dx}\coth^{-1}(\sin x^2) = \frac{1}{1-\csc^2(\sin x^2)}$

$\Rightarrow \frac{2x\cos x^2}{1-\csc^2(\sin x^2)}$

Student ID: 201449820

Student Name: Mohammad Jeoldavi

Serial Number: 21

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

Q1)

$$\frac{dt}{dy} = \frac{1}{2\sqrt{1+x^3}}$$

$$\frac{dt}{dy} = \frac{2\sqrt{1+x^3}}{3}$$

$$4 = \frac{2\sqrt{1+x^3}}{3}$$

$$\boxed{\frac{dt}{dy} = 12}$$

Q2)

$\boxed{r = 3\text{ m}}$ $\boxed{A = \pi r^2}$

$$\frac{dt}{dy} = \pi r^2$$

$$\rightarrow \frac{dt}{dy} = 2r\pi$$

$$\rightarrow \frac{dt}{dy} = 2\cdot 3\,\pi$$

$$\rightarrow \boxed{\frac{dt}{dy} = 6\pi}$$

Q3)

$$\boxed{\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right)}$$

$$\rightarrow \frac{d}{dx}\left(\operatorname{sech}\operatorname{csch}(\sin x^2)\right) + \left(\coth^{-1}(\cos x^2)\right)$$

$$\frac{d}{dx}$$

Student ID: 201427340

Student Name: Ahmed Atody

Serial Number: 2

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

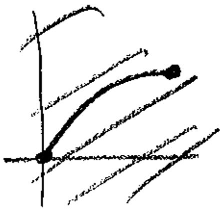
1. (4 pts) A particle moves along the curve $y = \sqrt{1 + x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.



1

$$\frac{dy}{dt} = \frac{3x^2}{\sqrt{1+x^3}}\,\frac{dx}{dt}$$

$$4 = \frac{12}{\sqrt{9}}\,\frac{dx}{dt}$$

$$4 = \frac{\cancel{12}^{4}}{\cancel{9}_{3}}\,\frac{dx}{dt}$$

$$12 = 4\,\frac{dx}{dt}$$

$$3 = \frac{dx}{dt}$$

2 $f(x) = \pi r^2$ * $f'(x) = 2\pi r$

$a = 0$

$\cancel{f(x) = f(a) + f'(a)(x-a)}$

$\cancel{f(x) = 0 + 0 = 0}$

$$dy = f'(x)\,dx$$

$$dy = 2\pi r\,(0.03)$$

$$dy = 6\pi\,\frac{3}{100}$$

$$\boxed{dy = 0.18\pi}$$

$$\frac{d}{dx}\left[\coth^{-1}(\sin x^2)\right] \qquad \cosh^2 - \sinh^2 = 1$$

$$\cosh^2 = 1 + \sinh^2$$

$$\Rightarrow \frac{d}{dx}\coth^{-1}x \Rightarrow \frac{1}{1+x^2}$$

$$\Rightarrow \frac{d}{dx}\left[\coth^{-1}(\sin x^2)\right] = \frac{1}{1+\sin^2 x^2}$$

$$= \frac{1}{\cosh^2 x^2}$$

~~coth x~~

~~coth y = x~~

$$\cancel{\frac{e^y + e^y}{e^y - e^x} = x}$$

$$\cancel{e^y + e^{-y} = xe^y - xe^{-y}}$$

Student ID: 20144920[redacted]

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Student Name: [redacted]

Serial Number:

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point (2, 3), the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

$$f'(x) = \tfrac{1}{2}(1+x^3)^{\frac{1}{2}-1}(3x^2)$$
$$= \tfrac{1}{2}(1+x^3)^{-\frac{1}{2}}(3x^2)$$

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

1

$$= \frac{3x^2}{2\sqrt{1+x^3}} = \frac{dy}{dx}$$

$$= \frac{3x^2}{2\sqrt{1+x^3}} = \frac{4}{dx}$$

$x = 2$

$$\Rightarrow \frac{3\cdot(2)^2}{2\sqrt{1+2^3}} = \frac{4}{dx}$$

$$\frac{12}{2\sqrt{1+8}} = \frac{4}{dx}$$

$$\frac{\cancel{12}\,2}{\cancel{6}\,1} = \frac{4}{dx}$$

$$dx = \frac{4}{2}$$

$$\boxed{= 2\ \frac{cm}{s}}$$

2

area $= 2r\pi$

error in area $= (2)(0.03)(\pi)$

$\boxed{= 0.06\pi}$

$$2\frac{dD}{dr} = r\pi = \pi + r$$

$$\frac{dD}{dr} = \frac{\pi + r}{2}$$

3

$\cot x = -\csc^2$

$-\csc^2 h^{-1}(\sin x^2) \cdot -\cos x^2$

$= -\csc^2 h^{-1}(-\cos x^2 \cdot 2x) \cdot \sin x^2 \cdot 2x$

$= 2x\sin x^2 \csc^2 h^{-1}(-2x\cos x^2)$

$f(x) = y$

$f(y)^{-1} = x$

Student ID: 201460280

Student Name: Abdullah Aldraiweesh

Serial Number: 25

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1 + x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

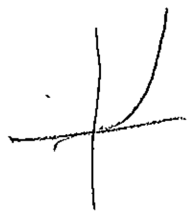
3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

---

1)



$\cancel{\mathscr{F}}\, f(x)' = y' = \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 x'$

$\Rightarrow 8\sqrt{1+x^3} = 3x^2 x'$

$\Rightarrow x' = \frac{8\sqrt{1+x^3}}{3x^2} = \frac{24}{27} = \frac{8}{9}$

2) $r = 3$, $d = 0.03$

$A = \pi r^2$

$A' = 2\pi r$

$dy = f'(x)\, dx$

$\Rightarrow d_y = 6\pi\,(0.03) \Rightarrow dy = 0.18\,\pi$

3) $(\cosh^{-1})' = \frac{1}{\sqrt{1-x^2}} = \frac{1}{\sqrt{1-(\sin x^2)^2}} = \frac{1}{\sqrt{(\cos x^2)^2}}$

$= \frac{1}{\cos x^2} = \sec x^2$

Student ID: 201435300

Student Name: Taha, Faisal M

Serial Number: 7

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

$$\frac{dy}{dt} = \frac{3x^2 \frac{dx}{dt}}{2\sqrt{1+x^3}}$$

$$4 = \frac{3x^2 \frac{dx}{dt}}{2\sqrt{1+x^3}}$$

$$8\sqrt{1+8} = 12\frac{dx}{dt}$$

$$\frac{dx}{dt} = \frac{\cancel{8}\cdot\cancel{3}}{\cancel{12}}$$

$$\frac{dx}{dt} = 2 \text{ cm/s}$$

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

πr^2

2. $r=3$

area $= 9\pi$

$$\frac{\text{reletive error} - 3}{3} = 0.03$$

rertee. erorr $= 0.09 + 3$

relive erorr $= 3.09$

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

3. $\sin(x^2)(2x)$

$$\frac{1}{\sqrt{x^2-1}}$$

$$\frac{1}{\sqrt{x^2+1}}$$

$$\frac{\sqrt{x^2+1}}{\sqrt{x^2-1}}$$

$$\frac{\sqrt{x^2+1}\ \sqrt{x^2-1}}{x^2-1}$$

$$\sqrt{(x^4-1)^2}$$

$$\frac{x^4-1}{x^2-1}$$

$\sin^2 x + \cos$

Student ID: 201454100

Student Name: Maan AlSouqf

Serial Number: 24

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

πr^2

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

$\frac{dy}{dt} = 4\ cm/s \qquad f(x) = \sqrt{1+x^3}$

$\frac{dx}{dt} = ?$ at $(2,3)$

$f(x) = (1+x^3)^{\frac{1}{2}}$

$\frac{dy}{dt} = \frac{1}{2}\frac{1}{\sqrt{x^3+1}} \cdot 3x^2 \frac{dx}{dt}$

$\frac{dy}{dt} = \frac{1}{2\sqrt{x^3+1}} \cdot 3x^2 \frac{dx}{dt}$

$4 = \frac{1}{2\sqrt{28}} \cdot 27 \frac{dx}{dt}$

$4 = \frac{27}{4\sqrt{7}} \frac{dx}{dt}$

$\frac{dx}{dt} = \frac{4}{\frac{27}{4\sqrt{7}}}$

$\frac{dx}{dt} = 4 \cdot \frac{4\sqrt{7}}{27}$

$\frac{dx}{dt} = \frac{16\sqrt{7}}{27}$ cm/s

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

3

$\frac{1}{1+\sin x^2}$

$\coth^{-1} = \frac{1}{1-x^2} = \frac{d}{dx}$ of $\coth^{-1}$

$= \frac{1}{1-(\sin x^2)^2}$

$= \frac{-1}{1-\sin^2 x^4}$

$= \frac{1}{\cos^2 x^4} = \sec^2 x^4$

Student ID: 201480560

Student Name: Mosa Almutahhar

Serial Number: 32

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

1) $\frac{dy}{dt} = 4 \text{ cm/s}$ when $y=3$, $x=2$

$y = \sqrt{1+x^3}$

$\Rightarrow \frac{dy}{dt} = \frac{3x^2}{2\sqrt{1+x^3}} \cdot \frac{dx}{dt}$

$\frac{dx}{dt} = \frac{dy}{dt} \cdot \frac{2\sqrt{1+x^3}}{3x^2}$

$\frac{dx}{dt} = (4) \cdot \frac{2\sqrt{1+(8)}}{3(4)} = \boxed{2 \text{ cm/s}}$

2) $dr = 0.03$, $r = 3$, $A = \pi r^2$

$\frac{dA}{A} = \frac{2\pi r\, dr}{\pi r^2} = \frac{2dr}{r} = \frac{2(0.03)}{3}$

$\frac{dA}{A} = \frac{2\frac{3}{100}}{3} = \frac{6}{100}\cdot\frac{1}{3} = \boxed{0.02}$

$\left(\frac{d}{dx}\coth^{-1} = \frac{1}{1-x^2}\right)$

3) $\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right) = \frac{\cos(x^2)\cdot 2x}{1-(\sin x^2)^2}$

$= \frac{\cos x^2 \cdot 2x}{(1-\sin x^2)(1+\sin x^2)}$

$= \frac{2x}{1+\sin x^2} = -\frac{2x}{\cos x^2}$

Student ID: Abdulaziz Ahmed Alrashdi

Student Name: 201441740

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Serial Number: 12

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point (2, 3), the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

$y = \sqrt{1+x^3}$

$\Rightarrow \frac{dy}{s} = \sqrt{1+3x^2}\,\frac{dx}{s}$

$\frac{dy}{s} = 4$

$\frac{dx}{s} = ?!$

$4 = \sqrt{1+3(2)^2}\,\frac{dx}{s}$

$16 = 1 + 12\frac{dx}{s}$

$\frac{15}{12} = \frac{dx}{s}$

$\frac{dx}{s} = \frac{15}{12}$ cm/s

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find
$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$
Simplify your answer.

$\left[\frac{1}{1-x^2}\right]$

$= (\coth^{-1})'(\sin x^2) + \coth^{-1}(\sin x^2)'$

$\Rightarrow \frac{1}{1-x^2}(\sin x^2) + 2\coth^{-1}\sin x\cos x$

$\Rightarrow \frac{\sin x^2}{1-x^2} + 2\coth^{-1}\sin x\cos x$

$= \sin x\left(\frac{\sin}{1-x^2} + 2\coth^{-1}\cos x\right)$

2) $r = 3m$ $\quad$ err $= 0.03m$ $\quad$ relative err $= ?!$

$f(x)$

~~$A = r^2$~~ $\quad$ Area $= r^2$

$f(a) + f(a)'(x-a)$

$\Rightarrow f(3) + f(3)'(\overset{0.03}{x} - 3)$

$\Rightarrow 9 + (6)(\overset{0.03}{x} - 3) \Leftrightarrow 6x - 18 + 9$

$\boxed{-9} \approx \Leftarrow 6x - 9$

$$(\coth^{-1})' = \frac{1}{1-x^2}$$

$\coth^{-1} =$ ~~ln~~

Student ID: 201470160

Student Name: Hussin, Alymani

Serial Number: 29

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

$\coth^{-1} x = y$

$\coth y = x$

$\coth y = \frac{\cosh}{\sinh}$

$x = \cancel{\frac{e^x + e^{-x}}{e^x - e^{-x}}}$

$\sin y = x$

2

$$\frac{d}{dx}\left(\coth^{-1}(\sin^2 x)\right)$$

$dy = f'(x)\ dx$

Student ID: 201439720

Student Name: Faisal AlZahrani

Serial Number: 11

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

1) $y y' = \frac{3x^2}{2\sqrt{1+x^3}} \frac{dx}{dt}$

$(3)(4) = \frac{3(4)}{2\sqrt{1+8}} \frac{dx}{dt}$

$12 = \frac{12}{6} \frac{dx}{dt}$

rate of change of x-Coordinate $= 6$ cm/s

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

2) $dy = f'(x)\ dx \qquad A = 2\pi r^2$

$dy = 4\pi r\ dx$

$dy = 4\pi(3)(0.03)$

$dy = 0.4\pi$

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

3) $\frac{1}{1-\sin^2 x^2} \cdot \cos x^2 \cdot 2x$

$= \frac{2x \cos x^2}{\cos^2 x^2}$

$= \frac{2x}{\cos x^2}$

Student ID: 205188990

Student Name: Osameh

Serial Number: 34

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

1. $y = \sqrt{1+x^3}$

$$\frac{dy}{dt} = \frac{3x^2 \frac{dx}{dt}}{2\sqrt{1+x^3}}$$

$$4 = \frac{3(2)^2 \frac{dx}{dt}}{2\sqrt{1+2^3}}$$

$$4 = \frac{12 \frac{dx}{dt}}{6}$$

$$\boxed{\frac{dx}{dt} = 2 \text{ cm/s}}$$

2. $f(x) = \pi r^2$

Area $= \pi r^2$ $\quad r = 3\text{m}$

$d(A) = 2\pi r\,(dr)(1-a)$

$dA = 2\pi(3)(0.03)$

$dA = 6\pi(0.03)$

$dA = \frac{9\pi}{50}$

relative error $\boxed{\frac{dA}{f(x)}} = \frac{6\pi(0.03)}{\pi 3(3)^2} = \frac{2(0.03)}{3} = \frac{0.06}{3}$

$\boxed{= 0.02}$

3. $\frac{d}{dx}\left(\coth^{-1}((\sin x^2)\right)$

$$= \frac{1}{1+x^2} \cdot \cos x^2 \cdot 2x$$

$$\boxed{= \frac{2x\cos x^2}{1+\sin x^2}}$$

$\sin^2 x$

Student ID: 201447420

Student Name: Ibrahim Alyami

Serial Number: 17

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

$y = \sqrt{1+x^3}$

$= \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 \cdot \frac{dy}{dx}$

$\frac{dy}{dt} (4) = \frac{1}{2\sqrt{1+x^3}} \cdot 3x^2 \cdot \frac{dy}{dt}$

$12 = \frac{1}{2\sqrt{1+4^3}} \cdot 3x^2 \cdot \frac{dy}{dt}$

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

Student ID: 201449180

Student Name: Faisal Al-Mubar

Serial Number: 19

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

$\boxed{1}$

$$\frac{dy}{dt} = \left(\frac{3x^2}{2\sqrt{1+x^3}}\right)\frac{dx}{dt}$$

$$4 = \left(\frac{3(2)^2}{2\sqrt{1+(2)^3}}\right)\frac{dx}{dt}$$

$$\frac{24}{12} = \frac{dx}{dt}$$

$$2 = \frac{dx}{dt}$$

$$\frac{dx}{dt} = 2 \text{ cm/s}$$

$\boxed{2}$ $A = r^2\pi$

$$\frac{dA}{dt} = 2r\pi\frac{dr}{dt}$$

$$\frac{dA}{dt} = 2r\pi(0.03)$$

$\boxed{3}$

$$\frac{\cos(x^2)\,2x}{1-(\sin x^2)^2}$$

$$= \frac{\cos(x^2)\,2x}{\cos^2(x^2)}$$

$$= \frac{2x}{\cos(x^2)}$$

$\cos^2 x + \sin^2 x = 1$

$1 - \sin^2 x$

Student ID: 201427580

Student Name: Abdulrahman Alshathry

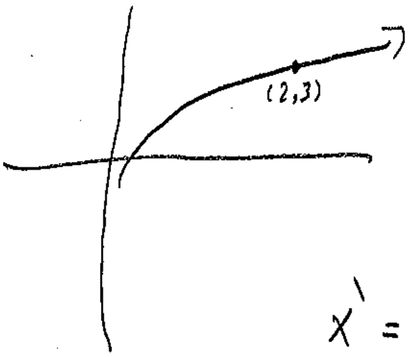
Serial Number: 03

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?



$y^2 = x^3 + 1$

$f'(a) = 2yy' = 3x^2x' + 1$

$x' = \dfrac{2yy' - 1}{3x^2}$

$\dfrac{dy}{dt} = 4$ cm/s

$\dfrac{dx}{dt} = ??$

$x' = \dfrac{2(3)(4) - 1}{3(2)^2}$

$x' = \dfrac{24 - 1}{3(4)}$

$x' = \dfrac{23}{12}$ cm/s

So $\dfrac{dx}{dt}$ is changing with a rate of $\dfrac{23}{12}$ cm/s

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

πr^2

$\boxed{2}$ $dy = f'(a)\, dx$

$dy = 2\pi r\, dx$

$dy = 2\pi(3)(0.03)$

$dy = 6\pi(0.03)$

relative area error $=$

$\left| \dfrac{6\pi(0.03) - 6\pi}{6\pi} \right| \times 100 =$

Note:
Sorry hard to calculate

$\boxed{3}$ $\dfrac{1}{(1-(\sin x^2)^2)} \cdot 2x\cos x^2 = \dfrac{2x\cos x^2}{(\cos x^2)^2} = \dfrac{2x}{\cos x^2} = 2x\sec x^2$

Student ID: 201439280

Student Name: Bandar Aldahash

Serial Number: 10

Math 101, Section 32
Fall 2015, Term 151

Quiz 5
Version A

Instructions: Show Your Work!

1. (4 pts) A particle moves along the curve $y = \sqrt{1+x^3}$. As it reaches the point $(2,3)$, the y-coordinate is increasing at a rate of 4 cm/s. At this instant, what is the rate at which the x-coordinate is changing?

2. (3 pts) The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, what is the relative error in the area?

3. (3 pts) Find

$$\frac{d}{dx}\left(\coth^{-1}(\sin x^2)\right).$$

Simplify your answer.

2) $A = \pi r^2$