1. If $f(x) = e^x + x^e$, then $f'(x) =$

(a) $e^x + ex^{e-1}$

(b) e^x

(c) $e^x - ex^{e-1}$

(d) $e^x + xe$

(e) ex^{e-1}

2. Suppose $y = \sqrt{2x+1}$, where x and y are functions of t. If $\dfrac{dx}{dt} = 3$, then the value of $\dfrac{dy}{dt}$, when $x = 4$, equals to

(a) 1

(b) 3

(c) 2

(d) 0

(e) 12

3. $\lim_{t \to 0} \frac{\sec t - 1}{2t^2}$

$\lim_{t \to 0} \frac{\sec t - 1}{3t^2} = \frac{1}{6}$

(a) equals $\frac{1}{4}$

(b) equals $\frac{1}{2}$

(c) equals 1

(d) equals $\frac{1}{6}$

(e) does not exist

4. The equation of the normal line to the curve $y = \frac{x + \sin x}{1 + \cos x}$ at $x = 0$ is

(a) $y = -x$

(b) $y = x$

(c) $y = \frac{1}{2}x$

(d) $y = 0$

(e) $y = -\frac{1}{2}x$

5. Let $y(x) = \left[\sin\left(x - 1 + \frac{\pi}{2}\right)\right]^{\ln x}$. Then $y'(1) =$

(a) 0

(b) 1

(c) -1

(d) $\frac{\pi}{2}$

(e) π

6. If $y = 7 - 3u^2$, and $u = \tan\left(\frac{x}{2}\right)$, then $\frac{dy}{dx}$ when $u = \sqrt{3}$ equals to:

(a) $-12\sqrt{3}$

(b) $-6\sqrt{3}$

(c) $6\sqrt{3}$

(d) 0

(e) $\frac{3}{2}\sqrt{3}$

7. If $y = \sqrt{\dfrac{e^{x-1}}{x^2+3}}$, then $y'(1) =$

(a) $\dfrac{1}{8}$

(b) $\dfrac{1}{2}$

(c) 0

(d) $\dfrac{1}{6}$

(e) $\dfrac{1}{4}$

8. The derivative of $y = 7\cos^{-1}(\sin^{-1} t)$ is

(a) $\dfrac{-7}{\sqrt{(1-t^2)(1-(\sin^{-1}t)^2)}}$

(b) $\dfrac{7\sin^{-1}t}{\sqrt{(1-t^2)(1-(\sin^{-1}t)^2)}}$

(c) $\dfrac{-7}{\sqrt{(1-(\sin^{-1}t)^2)}}$

(d) $\dfrac{7}{\sqrt{(1-(\cos^{-1}t)^2)}}$

(e) $\dfrac{-7}{\sqrt{(1-t^2)(1-(\cos^{-1}t)^2)}}$

For $y = 7\sin^{-1}(\cos^{-1} t)$, the answer is e

9. The slope of the line tangent to the curve

$$x^2 + y^2 + \tan(xy) = 1 + \sin(y-1)$$

at the point $(0, 1)$ is

(a) -1

(b) 1

(c) $\frac{1}{2}$

(d) $-\frac{1}{2}$

(e) 0

10. If $x^y = e^{x-y}$, then $\frac{dy}{dx} =$

(a) $\frac{x-y}{x(1+\ln x)}$

(b) $\frac{x-y}{1+\ln x}$

(c) $\frac{1}{x(1+\ln x)}$

(d) $\frac{1}{yx^{y-1}+e^{x-y}}$

(e) $\frac{1-yx^{y-1}}{e^{x-y}}$

11. An object moves along the x-axis with position function at time t given by

$$s(t) = t^3 - 3t^2 - 9t - 10$$

When is the object slowing down?

(a) $1 < t < 3$

(b) $0 < t < 1$ and $t > 3$

(c) $t > 0$

(d) never

(e) $t > 1$

12. A particle moves according to a law of motion $s = f(t) = \cos\left(\frac{\pi t}{2}\right)$, where t is measured in seconds and s in meters. The total distance in meters traveled by the particle during the first 5 seconds:

(a) 5

(b) 6

(c) 4

(d) 3

(e) 7

13. If $y = 2^x \log_2(1 + x^2)$, then $y'(1) =$

(a) $\ln 4 + \dfrac{2}{\ln 2}$

(b) $\ln 2 + \dfrac{2}{\ln 2}$

(c) $\ln 4 + \dfrac{1}{\ln 2}$

(d) $\ln 2 + \dfrac{4}{\ln 2}$

(e) $\ln 4 + \dfrac{4}{\ln 2}$

14. $\lim\limits_{n \to \infty} \left(1 + \dfrac{3}{n}\right)^{2n} =$

(a) e^6

(b) e^3

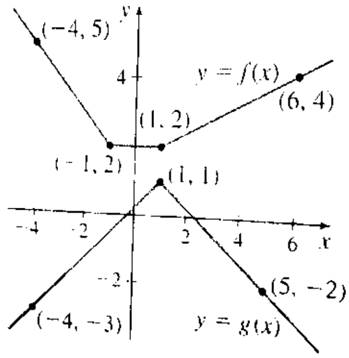
(c) e^9

(d) e

(e) e^2

$\lim\limits_{n \to \infty} \left(1 + \dfrac{3}{n}\right)^{3n} = e^9$

15. Let $u(x) = f(x) \cdot g(x)$. By using their graphs, $5u'(0) =$



(a) 8
(b) 10
(c) 12
(d) 14
(e) 16

$10u'(0) = 16$

16. If f is differentiable where $f(2) = 1$ and $f'(2) = -1$, then $\lim_{x \to 2} \frac{xf(2) - 2f(x)}{x - 2}$

(a) equals 3
(b) equals 0
(c) equals 2
(d) equals 1
(e) does not exist

17. If the curve $f(x) = 3x^3 + ax^2 + 16x + 1$ has only one horizontal tangent line, then a possible value of a is

(a) -12

(b) $\frac{4}{3}$

(c) $\frac{3}{4}$

(d) -4

(e) 0

18. Let $f(x) = \frac{4}{2x+1}$, $g(x) = k \cot x$, and $k > -1$ is a constant.

Given that $(f \circ g)'\left(\frac{\pi}{4}\right) = -16$, then the value of k equals to

(a) $-\frac{1}{4}$

(b) 0

(c) $\frac{1}{4}$

(d) 1

(e) 4

19. How many points on $x^2 + y^2 - 4x = 4$ does the rate of change of x equal to the rate of change of y given that this rate is not zero and x and y are functions of t?

(a) two

(b) one

(c) none

(d) three

(e) four

20. If $f(x) = \dfrac{1}{1-x}$, then $f^{(2018)}(2) =$

(a) $-(2018)!$

(b) $(2018)!$

(c) $-(2017)!$

(d) $(2017)!$

(e) $(2019)!$