King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Applied Calculus I, Math 132
Major Exam I, Semester I, 2009-2010
Monday Novamber 02, 2009
Net Time Allowed: 90 minutes
Master

1. Calculators and mobile phones are NOT allowed in this exam.

1. If $f(x) = (x-1)^5 \log_2(x)$,then

    (a) $f^{'}(1) \leq 1$.
    (b) $f^{'}(1) > 1$.
    (c) $f^{'}(1) < -2$.
    (d) $f^{'}(1) < -4$.
    (e) $f^{'}(1) \geq 4$.

2. If $f(x) = e^{2x}(\ln(2x))^2$, then

    (a) $f^{'}(\frac{e}{2}) = 2e^e(1+2e^{-1})$.
    (b) $f^{'}(\frac{e}{2}) = 4e^e$.
    (c) $f^{'}(\frac{e}{2}) = 0$.
    (d) $f^{'}(\frac{e}{2}) = 3e^e$.
    (e) $f^{'}(\frac{e}{2}) = 2e^e(2+e^{-1})$.

3. An equation to the tangent of $f(x) = \frac{1-x}{1+x^2}$ at $x = 1$ is given by:

(a) $f(x) = -\frac{1}{2}x + \frac{1}{2}$.

(b) $f(x) = \frac{1}{2}x + \frac{1}{2}$.

(c) $f(x) = -x - 1$.

(d) $f(x) = -\frac{3}{2}x + \frac{3}{2}$.

(e) $f(x) = -\frac{3}{2}x - \frac{3}{2}$.

4. The function $f(x) = \frac{4-x^2}{x^3-x^2-4x+4}$ has a discontinuity only at

(a) $x = 1,\ x = 2$ and $x = -2$.

(b) $x = 1$.

(c) $x = 1$ and $x = 2$.

(d) $x = 1$ and $x = -2$.

(e) is continuous everywhere.

5. The tangent to the curve $y = e^{(\sqrt[3]{x^2}+x)}$ at $x = -1$ intercepts the y-axis at the point

(a) $(0, \frac{4}{3})$.

(b) $(0, 1)$.

(c) $(0, -\frac{1}{3})$.

(d) $(0, 2)$.

(e) $(-1, 1)$.

6. The function $g(x) = \begin{cases} \frac{2x^2-1}{x-2} & \text{if } x \leq 1 \\ \frac{x^2+x}{x-3} & \text{if } x > 1 \end{cases}$ has a discontinuity at

(a) $x = 3$.

(b) $x = 1$.

(c) $x = 2$.

(d) $x = 1,\ x = 2$ and $x = 3$.

(e) $x = 1.$ and $x = 3$.

7. If $y = \ln(u^3 + 3u^2 - u - 1)$ and $u = x^3 + 3x^2 - x - 1$, then

(a) $\frac{dy}{dx}\mid_{x=0} \leq 3$.

(b) $\frac{dy}{dx}\mid_{x=0} > 3$.

(c) $\frac{dy}{dx}\mid_{x=0} > 5$.

(d) $\frac{dy}{dx}\mid_{x=0} \leq 0$.

(e) $\frac{dy}{dx}\mid_{x=0} < -5$.

8. $\lim\limits_{x \to (\frac{5}{2})^+} \frac{x}{2x^2-7x+5} =$

(a) $+\infty$.

(b) 0.

(c) $-\infty$.

(d) $\frac{5}{2}$.

(e) $\frac{2}{5}$.

9. $\lim_{x\to\infty} \frac{4x^4+3x^3+2x^2+x}{(3-2x^2)(x^2-x-1)} =$

(a) -2

(b) $+\infty$.

(c) $-\infty$.

(d) 0.

(e) 2.

10. $f(x) = e^{\sqrt{x}} 3^{\ln x}$, then

(a) $f'(1) = e(\frac{1}{2} + \ln 3)$.

(b) $f'(1) = \frac{1}{2} e \ln 3$.

(c) $f'(1) = \frac{3}{2}$.

(d) $f'(1) = \frac{e}{2} + \ln 3$.

(e) 0.

11. $\lim_{x \to 2} \frac{3x^3 - 5x^2 - x - 2}{x^2 - 5x + 6} =$

(a) -15

(b) $+2$.

(c) not define.

(d) $+5$.

(e) 0.

12. A manufacturer determines that m employees will produce a total of q units of a product per day, where

$$q = \frac{m}{\sqrt{m - 8}}.$$

If the demand equation for the product is $p = \frac{100}{q+1}$. Find the marginal revenue product if $m = 9$.

(a) ≤ -3.

(b) ≥ 3.

(c) ≤ -5.

(d) ≥ 5.

(e) $= 0$.

13. If $f(x) = \sqrt{\frac{x+1}{x-1}}$, then

(a) $f'(x) = \frac{-1}{\sqrt{(x+1)(x-1)^3}}$.

(b) $f'(x) = 2\sqrt{\frac{x-1}{x+1}}(x-1)$.

(c) $f'(x) = \frac{2(x-1)^2}{\sqrt{(x+1)(x-1)}}$.

(d) $f'(x) = \frac{-\sqrt{x-1}}{\sqrt{(x+1)(x-1)}}$.

(e) $f'(x) = -\sqrt{\frac{x+1}{x-1}} \cdot \frac{2}{(x-1)^2}$.

14. The volume of the tetraeder as a function of its edge length ℓ is $V = \frac{\sqrt{2}}{12}\ell^3$. The relative rate of change of V, with respect to ℓ, when $\ell = 2$ is

(a) $\frac{3}{2}$.

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

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

(d) 10.

(e) $\frac{\sqrt{2}}{4}$.

15. In the discussions of contemporary waters of shallows seas, a scientist claims that in such waters the total organic matter y (in milligrams per liter) is a function of species diversity x (the number of species per thousand individual(s)). If $y = \frac{100}{x}$ at what rate is the total organic matter changing with respect to species diversity when $x = 5$. The rate is

(a) ≤ -3.

(b) ≤ -10.

(c) ≥ -3.

(d) ≥ 10.

(e) ≥ 3.

16. If $f(x) = (2x-3)^5 + (2x-3) - 2^{(2x-3)}$, then $\lim_{h \to 0} f(\frac{3}{2} + h) =$

(a) -1.

(b) 1.

(c) -2.

(d) 0.

(e) Does not exist.

17. For all $x \in \mathbb{R}$ the $\lim_{h \to 0} \frac{\sqrt[5]{(x+h)^2} - \sqrt[5]{x^2}}{h}$ is given by

(a) $\frac{2}{5\sqrt[5]{x^3}}$.

(b) $\frac{5}{2\sqrt[5]{x^3}}$.

(c) $-\frac{2\sqrt{x^3}}{5}$.

(d) $\frac{2}{5}x^{-\frac{3}{5}} - \frac{2}{5}\sqrt[5]{x^2}$.

(e) $\sqrt[5]{x^3} - x^2$.

18. If $f(x) = x^2 - x$ and $g(x) = x + \frac{1}{x}$, then $\frac{d}{dx} f(g(x)) =$

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

(b) $x^2 - x - \frac{1}{x} + \frac{1}{x^2} + 2$.

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

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

(e) $x^2 - x - \frac{1}{x} + \frac{1}{x^2}$.