King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

Calculus I
EXAM II
Semester I, Term 081
Monday December 29, 2008
Net Time Allowed: 120 minutes

MASTER VERSION

1. The slope of the tangent line to the graph of $f(x) = \dfrac{x^2 - 2\sqrt{x}}{2x + 3}$ at $x = 1$ is equal to

(a) $\dfrac{7}{25}$

(b) $-\dfrac{3}{25}$

(c) $\dfrac{9}{25}$

(d) $-\dfrac{7}{25}$

(e) $\dfrac{3}{25}$

2. If the position of a particle is given by the equation

$$S(t) = 2t^3 - 9t^2 + 12t,$$

where t is measured in seconds and S in meters, then the total distance traveled by the particle during the time interval $[0, 2]$ is

(a) 6 meters

(b) 9 meters

(c) 1 meter

(d) 4 meters

(e) 5 meters

3. $\dfrac{d}{dt}\left(\dfrac{2t-1}{3t+2}\right)^8 =$

(a) $\dfrac{56(2t-1)^7}{(3t+2)^9}$

(b) $\dfrac{48(2t-1)^7}{(3t+2)^{18}}$

(c) $\dfrac{56(2t-1)^7}{(3t+2)^{18}}$

(d) $\dfrac{72(2t-1)^7}{(3t+2)^9}$

(e) $\dfrac{24(2t-1)^7}{(3t+2)^9}$

4. If $f(x) = (\cosh x)^2$, then $f'(\ln 2) =$

(a) $\dfrac{15}{8}$

(b) $\dfrac{5}{16}$

(c) $\dfrac{15}{24}$

(d) $\dfrac{15}{4}$

(e) $\dfrac{3}{8}$

5. $\lim_{x\to 0} \dfrac{3\tan 2x - 5\tan 3x}{7x\cos x + 4\sin 5x} =$

(a) $-\dfrac{1}{3}$

(b) $\dfrac{1}{27}$

(c) $-\dfrac{1}{9}$

(d) $\dfrac{5}{27}$

(e) $-\dfrac{8}{9}$

6. If $f(x) = \cos x$, then $f^{(99)}(x) =$

(a) $\sin x$

(b) $\cos x$

(c) $-\sin x$

(d) $-\cos x$

(e) none of the other given answers

7. Which one of the following statements is **FALSE** about the function $f(x) = x^{2/3}$?

(a) $\lim_{x\to 0^-} f'(x) = \lim_{x\to 0^+} f'(x) = +\infty$

(b) f is continuous at $(0,0)$

(c) f has a vertical tangent at $x = 0$

(d) f has no horizontal tangents

(e) the domain of f' is $(-\infty, 0) \cup (0, \infty)$

8. If $f(x) = 3x \sin 2x$, then $\lim_{h\to 0} \frac{1}{h}\left[f\left(\frac{\pi}{2} + h\right) - f\left(\frac{\pi}{2}\right)\right] =$

(a) -3π

(b) $\frac{\sqrt{2}}{2} + 3\pi$

(c) $-\frac{3\pi\sqrt{2}}{2}$

(d) $3 + 6\pi$

(e) $-3 - 3\pi$

9. The equation of the horizontal tangent to the graph of $y = \sqrt{x}\, e^{-\sqrt{x}}$ is

(a) $y = \dfrac{1}{e}$

(b) $y = \dfrac{1}{\sqrt{e}}$

(c) $y = -\dfrac{1}{e}$

(d) $y = -\dfrac{1}{\sqrt{e}}$

(e) $y = \dfrac{\sqrt{2}}{e}$

10. $\lim\limits_{\theta \to 0} \dfrac{\cos\theta - 1}{3\tan^2\theta} =$

(a) $-\dfrac{1}{6}$

(b) $\dfrac{2}{3}$

(c) $-\dfrac{3}{2}$

(d) 0

(e) does not exist

11. If $\cosh x = \frac{5}{3}, \quad x < 0, \quad$ then the value of $\quad 9\sinh x - 20\tanh x =$

(a) 4

(b) -24

(c) -8

(d) 12

(e) $-\frac{4}{15}$

12. If $4x^2 + y^2 = 4, \quad$ then $\quad y'' =$

(a) $-\frac{16}{y^3}$

(b) $\frac{4x}{y^4}$

(c) $-\frac{16x^3}{y^3}$

(d) $\frac{16x}{y^4}$

(e) $-\frac{1}{4y^3}$

13. If $f(x) = \ln\left[\dfrac{\sin^2 x \ \tan^4 x}{(1+\cos^2 x)^3}\right]$, then $f'\left(\dfrac{\pi}{4}\right) =$

(a) 12

(b) 14

(c) 8

(d) 10

(e) 16

14. If $y = x^{1/x}$, then $\dfrac{dy}{dx} =$

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

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

(c) $-\,x^{-3+\frac{1}{x}}\ \ln x$

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

(e) $-\,x^{-3+\frac{1}{x}}$

15. If $g(x) = \sec(x^3)\ \cot(x^3)$, then $g'(x) =$

(a) $-3x^2 \csc(x^3)\ \cot(x^3)$

(b) $-3x^2 \sec(x^3)\ \tan(x^3)$

(c) $-3x^2 \csc(x^3)\ \tan(x^3)$

(d) $-3x^2 \sec(x^3)\ \cot(x^3)$

(e) $-3x^2 \sec(x^3)\ \csc^2(x^3)\ \tan(x^3)$

16. If $y = x \cos^{-1}\left(\frac{x}{2}\right) - \sqrt{4 - x^2}$, then $\frac{dy}{dx} =$

(a) $\cos^{-1}\left(\frac{x}{2}\right)$

(b) $\cos^{-1}\left(\frac{x}{2}\right) - \frac{2x}{\sqrt{4 - x^2}}$

(c) $\frac{1}{4}\cos^{-1}\left(\frac{x}{2}\right) - \frac{x}{\sqrt{4 - x^2}}$

(d) $\frac{1}{4}\cos^{-1}\left(\frac{x}{2}\right)$

(e) $2\cos^{-1}\left(\frac{x}{2}\right) - \frac{2x}{\sqrt{4 - x^2}}$

17. If $f(x) = \begin{cases} 3\,, & \text{if } x \le 0 \\ 3 - x\,, & \text{if } 0 < x < 2 \\ \dfrac{1}{3-x}\,, & \text{if } x \ge 2 \end{cases}$, then f is **not differentiable** at

(a) $x = 0,\ 2,$ and 3

(b) $x = 0,$ and 3 only

(c) $x = 2,$ and 3 only

(d) $x = 3$ only

(e) $x = 0,$ and 2 only

18. If the normal line to the parabola $y = x^2 + x$ at the point $(-1, 0)$ intersects the parabola a second time at the point (α, β), then $\alpha - \beta =$

(a) -1

(b) 2

(c) -2

(d) 1

(e) -3

19. If m is the slope of the tangent line to the graph of $2^{x+y} = x^2 + xy^2 + 1$ at the point $(-1, 1)$, then the product $(2 + \ln 2)\, m$ is equal to

(a) $-1 - \ln 2$

(b) -1

(c) $-2 + \ln 2$

(d) 1

(e) $2 - \ln 2$

20. The altitude of a triangle is increasing at a rate of $\frac{1}{2}$ cm/min while the area of the triangle is decreasing at a rate of $\frac{3}{2}$ cm^2/min. **The rate at which the base of the triangle is changing** when the altitude is 8 cm and the area is 80 cm^2 **is equal to**

(a) $-\frac{13}{8}$ cm/min

(b) $\frac{11}{8}$ cm/min

(c) $-\frac{11}{8}$ cm/min

(d) $\frac{7}{8}$ cm/min

(e) $-\frac{15}{8}$ cm/min

Q	MM	V1	V2	V3	V4
1	a	e	b	e	a
2	a	c	a	d	a
3	a	c	a	a	e
4	a	d	a	b	a
5	a	b	a	e	e
6	a	d	b	c	d
7	a	c	c	a	c
8	a	d	c	b	b
9	a	e	c	d	b
10	a	b	b	e	e
11	a	a	c	d	d
12	a	a	e	a	a
13	a	c	d	b	a
14	a	c	b	b	b
15	a	a	d	a	e
16	a	c	d	c	b
17	a	d	c	b	e
18	a	d	b	b	e
19	a	a	d	e	d
20	a	d	c	c	e