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

CODE 001 **Calculus I** **CODE 001**

EXAM II

Summer Term 083

Tuesday August 18, 2009

Net Time Allowed: 120 minutes

Name: ______________________________

ID: ____________________ Sec: ____________________.

Check that this exam has 20 questions.

Important Instructions:

1. All types of calculators, pagers or mobile phones are NOT allowed during the examination.
2. Use HB 2.5 pencils only.
3. Use a good eraser. DO NOT use the erasers attached to the pencil.
4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
7. When bubbling, make sure that the bubbled space is fully covered.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1. If the area A of a circle is increasing at the rate of $\frac{8\pi}{9}$ cm^2/min, then the rate of change of the radius of the circle when $A = \frac{\pi}{9}$ cm^2 is

(a) $\frac{4}{3}$ cm/min

(b) $\frac{2}{9}$ cm/min

(c) $\frac{1}{3}$ cm/min

(d) $\frac{2}{3}$ cm/min

(e) $\frac{1}{6}$ cm/min

2. If $F(y) = \left(y^{-2} - 3y^{-3}\right)\left(y^{-2} + 3y^{-3}\right)$, then $F'(1) =$

(a) 40

(b) -45

(c) -50

(d) 45

(e) 50

3. $\cosh\left(\frac{1}{3}\ln x\right) + \sinh\left(\frac{1}{3}\ln x\right) =$

(a) $e^{\sqrt[3]{x}}$

(b) $2\sqrt[3]{x}$

(c) $\sqrt[3]{x}$

(d) $e^{\sqrt[3]{x}} + e^{-\sqrt[3]{x}}$

(e) $\sqrt[3]{x} + \frac{1}{\sqrt[3]{x}}$

4. $\frac{d}{dx}\left(\frac{e^{x+1} - e^{x}}{e^{x}}\right) =$

(a) e^{x}

(b) 0

(c) e^{x+1}

(d) e

(e) 1

5. The position of a particle is given by the equation $s = f(t) = 2t^3 - 27t^2 + 108\,t$ where t is measured in seconds and s in meters. If the particle is moving in the negative direction on the largest time interval (α, β), then $5\alpha - 2\beta =$

(a) 2

(b) 10

(c) 1

(d) 3

(e) 9

6. The y-intercept of the normal line to the graph of $y = \dfrac{1-3x}{1-6x}$ at $x = \dfrac{1}{3}$ is

(a) $\left(0, \dfrac{1}{21}\right)$

(b) $\left(0, -\dfrac{1}{21}\right)$

(c) $\left(0, -\dfrac{1}{18}\right)$

(d) $\left(0, \dfrac{1}{12}\right)$

(e) $\left(0, \dfrac{1}{9}\right)$

7. If $y = \frac{1}{3}\tan^{-1}\left(\frac{x+1}{3}\right)$, then $\frac{dy}{dx} =$

(a) $9(x^2 + 2x + 10)^{-1}$

(b) $x(x^2 + 2x + 10)^{-1}$

(c) $(x^2 + 2x + 10)^{-1}$

(d) $3(x + 1)(x^2 + 2x + 10)^{-1}$

(e) $\frac{1}{3}(x + 1)(x^2 + 2x + 10)^{-1}$

8. The equation of the tangent line to the curve $y = \frac{\sec x}{x^2}$ at $x = \pi$, is

(a) $y = -\frac{3}{\pi^2}x + \frac{2}{\pi^2}$

(b) $y = -\frac{4}{\pi^3}x + \frac{3}{\pi^2}$

(c) $y = \frac{2}{\pi^3}x + \frac{1}{\pi^2}$

(d) $y = \frac{1}{\pi^3}x - \frac{2}{\pi^2}$

(e) $y = \frac{2}{\pi^3}x - \frac{3}{\pi^2}$

9. If $3x^2 - 4xy + y^2 = 15$, then $\dfrac{dy}{dx} =$

(a) $\dfrac{3x-2y}{2x-y}$

(b) $\dfrac{3x+2y}{2x-y}$

(c) $\dfrac{3}{2+y}$

(d) $\dfrac{3x-6y}{2-y}$

(e) $\dfrac{2x-3y}{x+2y}$

10. If $y = \dfrac{x^{2/3}(x-1)^{1/3}}{x+2}$, then $y'(2) =$ [Hint: Use logarithmic differentiation].

(a) $\dfrac{11\sqrt[3]{4}}{24}$

(b) $\dfrac{9\sqrt[3]{2}}{8}$

(c) $\dfrac{5\sqrt[3]{4}}{48}$

(d) $\dfrac{13\sqrt[3]{4}}{48}$

(e) $\dfrac{7\sqrt[3]{2}}{48}$

11. If $f(x) = \sin^2 x$, then $f^{(5)}(x) =$

(a) $\cos^2 x$

(b) $16(\cos^2 x - \sin^2 x)$

(c) $32 \sin x \cos x$

(d) $8 \sin x \cos x$

(e) $16 \sin^2 x \cos x$

12. If $L(x) = (f \circ g \circ h)(x)$, where $h(1) = 2$, $g(2) = 3$, $h'(1) = 4$, $g'(2) = 5$, and $f'(3) = 6$, then $L'(1) =$

(a) 720

(b) 240

(c) -50

(d) 50

(e) 120

13. If α and β are constants such that the function

$$f(x) = \begin{cases} \alpha x + \beta, & x < 0 \\ 2\sin x + 3\cos x, & x \geq 0 \end{cases}$$

is differentiable, then $f(-5) =$

(a) 9

(b) -7

(c) 3

(d) -5

(e) -8

14. If $f(x) = \cot\left(\frac{\pi}{4}\sqrt{\cot 2x}\right)$, then $f'\left(\frac{\pi}{8}\right) =$

(a) $\frac{\pi}{4}$

(b) π

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

(d) 4

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

15. If $f(x) = \sqrt{1+x^2}$ where $x > 0$, then $f(\sinh x) + f'(\text{csch } x) =$

(a) $\cosh x + \coth x$

(b) $\cosh x + \text{sech } x$

(c) $2\cosh x$

(d) $\cosh x + \sinh x$

(e) $2\cosh x + 1$

16. If $Ax^2 + By^2 = C$, where $A, B,$ and C are nonzero constants, then $y'' =$

(a) $-\dfrac{AC}{B^2y^3}$

(b) $-\dfrac{ABC}{y^3}$

(c) $-\dfrac{ACx}{By^2}$

(d) $-\dfrac{AB^2}{Cy^3}$

(e) $-\dfrac{AC}{B^4y^3}$

17. A particle is moving along the curve $y = x^2 + 1$. As the particle passes through the point $(1, 2)$, its y-coordinate increases at a rate of 10 cm/s. At this instant, the distance from the particle to the origin is changing at a rate of

(a) 5 cm/s

(b) $6\sqrt{5}$ cm/s

(c) $2\sqrt{5}$ cm/s

(d) $5\sqrt{5}$ cm/s

(e) 20 cm/s

18. If $f(x) = (\sin^{-1} x)^{x+\frac{1}{2}}$, then $f'\left(\frac{1}{2}\right) =$

(a) $\frac{\pi}{6} \ln \frac{\pi}{6} + \sqrt{3}$

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

(c) $\frac{\pi}{6} \ln \frac{\pi}{6} + \frac{2\sqrt{3}}{3}$

(d) $\frac{\pi}{6} \ln \frac{\pi}{6} + \frac{\pi\sqrt{3}}{18}$

(e) $\frac{\pi}{3} \ln \frac{\pi}{3} + \frac{\pi\sqrt{3}}{3}$

19. Let T be the tangent line to the parabola $y = x^2$ at the point $P(\alpha, \beta)$. If $\alpha < 0$ and T passes through the point $(-2, -5)$, then the slope of T is equal to

(a) -10

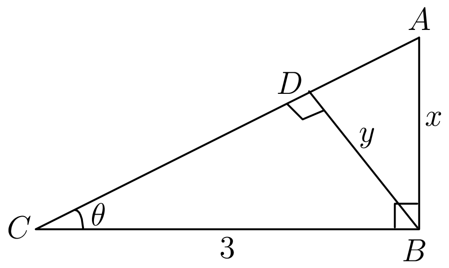
(b) 2

(c) -25

(d) -15

(e) 5

20. The given figure shows a right triangle ABC at B and BD is perpendicular to AC. If the lengths of AB, BD, and BC are, respectively, x, y, and 3, then $\lim_{\theta \to 0^+} \frac{x}{y}$



(a) is equal to $\frac{1}{3}$

(b) does not exist

(c) is equal to 3

(d) is equal to 0

(e) is equal to 1

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