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

CODE 001 **Math 102** **CODE 001**

Exam I

Term 081

Tuesday 11/11/2008

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. Which one of the following statements is **FALSE**: (f and g are continuous)

(a) If f is even on $[-a,a]$, then $\int_{-a}^{a} f(x)\,dx = 2\int_{-a}^{0} f(x)\,dx$

(b) $\int_a^b [f(x) - 3g(x)]dx = \int_a^b f(x)dx - 3\int_a^b g(x)\,dx$

(c) $\int_a^b f(x)dx =$ area below the graph of f from $x = a$ to $x = b$.

(d) If $2 \le f(x) \le 6$ on $[0,3]$, then $6 \le \int_0^3 f(x)\,dx \le 18$.

(e) If $f(x) \le g(x)$ on $[a,b]$, then $\int_a^b g(x)\,dx \ge \int_a^b f(x)\,dx$.

2. If $f(x) = \begin{cases} \dfrac{3}{x} & \text{if } x \le -1 \\ -3 & \text{if } x > -1, \end{cases}$ then $\int_{-3}^{0} f(x)\,dx$

(a) is equal to $3 - 3\ln 3$

(b) does not exist

(c) is equal to $3 + 3\ln 3$

(d) is equal to $-3 - \ln 3$

(e) is equal to $-3 - 3\ln 3$

3. If $g(x) = \int_{e^x}^{1} t \ln t \, dt$, then $g'(x) =$

(a) e^{2x}

(b) xe^x

(c) $-e^x$

(d) $-xe^x$

(e) $-xe^{2x}$

4. $\int_{-1}^{1} (3x-2)^{19} \, dx =$

(a) $\dfrac{1-5^{20}}{60}$

(b) 0

(c) $57(1-5^{18})$

(d) $\dfrac{5^{20}}{60}$

(e) $\dfrac{5^{20}-1}{20}$

5. Using three approximating rectangles and midpoints, the area under the graph of $f(x) = \dfrac{x}{x-1}$ from $x = 2$ to $x = 8$ is approximately equal to

(a) $\dfrac{29}{3}$

(b) $\dfrac{41}{12}$

(c) $\dfrac{47}{6}$

(d) $\dfrac{59}{6}$

(e) $\dfrac{43}{6}$

6. $\displaystyle\int \frac{(x-\sqrt[3]{x})^2}{\sqrt[3]{x^2}}\,dx =$

(a) $\dfrac{7}{3}x^{7/3} - x^{4/3} + 2x + C$

(b) $\dfrac{3}{7}x^{7/3} - \dfrac{3}{5}x^{5/3} + x + C$

(c) $\dfrac{3}{2}x^{2/3} + \dfrac{6}{5}x^{4/3} + \dfrac{1}{2}x^2 + C$

(d) $\dfrac{3}{7}x^{7/3} - \dfrac{6}{5}x^{5/3} + x + C$

(e) $\dfrac{1}{3}x^3 - \dfrac{6}{7}x^{7/3} + \dfrac{3}{5}x^{5/3} + C$

7. $\int e^{x^2+\ln x}\, dx =$

(a) $\frac{1}{x}e^{x^2} + C$

(b) $\frac{1}{2}e^{x^2} + C$

(c) $\dfrac{e^{x^2+\ln x}}{\left(2x+\frac{1}{x}\right)} + C$

(d) $e^{x^2+\ln x}\left(2x+\frac{1}{2}\right) + C$

(e) $e^x \ln x + C$

8. Using the definition of the definite integral, the value of the limit

$$\lim_{n\to+\infty} \sum_{i=1}^{n} \frac{2}{n}\sqrt{4+\frac{3i}{n}}$$

is equal to

(a) $\dfrac{32}{\sqrt{7}}$

(b) $\dfrac{4}{\sqrt{3}}$

(c) $\frac{2}{3}(7\sqrt{7}-8)$

(d) $\frac{4}{9}(7\sqrt{7}-8)$

(e) $\dfrac{28\sqrt{7}}{9}$

9. If $F(x) = \int_x^{x^2} \frac{\sin(2t)}{t^2} dt$, then $F(1) + F'(1) =$

(a) 0

(b) $\frac{\sin 2}{2}$

(c) $\sin 2$

(d) $1 + \sin 2$

(e) $3 \sin 2$

10. If the line $x = k$ divides the region bounded by the curves $y = \sqrt{x}, y = 0$ and $x = 4$ into two regions with equal area, then $k =$

(a) $\sqrt[3]{16}$

(b) 4

(c) 8

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

(e) 2

11. By interpreting it as an area, the value of the integral

$$\int_0^1 (|x-1| + 2\sqrt{1-x^2})\,dx$$

is equal to

(a) $\dfrac{\pi+1}{2}$

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

(c) $\pi + 1$

(d) $\pi + \dfrac{1}{4}$

(e) $\pi + \dfrac{1}{2}$

12. The volume of the solid generated by revolving the region between the y-axis and the curve $x = \dfrac{2}{y}$, $1 \le y \le 4$, about the y-axis is equal to

(a) 3π

(b) π

(c) $\dfrac{6\pi}{7}$

(d) 10π

(e) -3π

13. $\displaystyle\int \frac{1}{\sec t - \cos t}\, dt =$

(a) $\ln|\sin t| + C$

(b) $\cot t + C$

(c) $-\sec t + C$

(d) $\ln|\sec t - \cos t| + C$

(e) $-\csc t + C$

14. The acceleration (in m/s^2) and the initial velocity for a particle moving along a line are given by

$$a(t) = 2t - 1, v(0) = -2, \quad 0 \le t \le 2.$$

The distance traveled by the particle during the given time interval is

(a) $\dfrac{13}{3}m$

(b) $5m$

(c) $\dfrac{18}{3}m$

(d) $4m$

(e) $\dfrac{10}{3}m$

15. $\int_{-2}^{2} x^4(xe^{-x^2} + 5)dx =$

(a) 16

(b) -8

(c) 32

(d) 64

(e) 0

16. The area of the region bounded by the curves $x = -2y^2$ and $y = x + 1$ is

(a) $\dfrac{5}{24}$

(b) $\dfrac{5}{8}$

(c) $\dfrac{27}{8}$

(d) $\dfrac{1}{24}$

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

17. A solid has a circular base of radius 1 and center $(0,0)$. If the cross-sections of the solid perpendicular to the x-axis are semicircles, then the volume of the solid is equal to

(a) $\dfrac{2\pi}{3}$

(b) $\dfrac{16\pi}{3}$

(c) $\dfrac{8\pi}{3}$

(d) $\dfrac{\pi}{3}$

(e) $\dfrac{4\pi}{3}$

18. If the region enclosed by the curves $y = x^2$ and $y = 2x$ is rotated about the line $y = 5$, then the volume of the resulting solid is given by

(a) $\pi \int_0^2 [(5 - x^2)^2 - (5 - 2x)^2]\, dx$

(b) $\pi \int_0^4 \left[(\sqrt{y})^2 - \left(\frac{1}{2}\, y\right)^2\right]\, dy$

(c) $\pi \int_0^2 [(2x + 5)^2 - (x^2 + 5)^2]\, dx$

(d) $\pi \int_0^2 [(2x)^2 - (x^2)^2]\, dx$

(e) $\pi \int_0^4 \left[(5 - \sqrt{y})^2 - \left(5 - \frac{1}{2}\, y\right)^2\right]\, dy$

19. $\displaystyle\int \frac{x+2}{\sqrt[3]{3-x}}\,dx =$

(a) $-15(3-x)^{1/3} + \dfrac{3}{4}(3-x)^{4/3} + C$

(b) $\ln(3-x) + (3-x) + C$

(c) $\dfrac{5}{3}\ln(3-x) + \dfrac{1}{4}(3-x)^{4/3} + C$

(d) $\dfrac{3}{5}(3-x)^{5/3} + \dfrac{15}{2}(3-x)^{2/3} + C$

(e) $\dfrac{3}{5}(3-x)^{5/3} - \dfrac{15}{2}(3-x)^{2/3} + C$

20. If $\displaystyle\int_{-1}^{2} f(x)\,dx = 4$ and $\displaystyle\int_{1}^{2} f(2x)\,dx = 1$, then $\displaystyle\int_{-1/3}^{4/3} f(3x)\,dx =$

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

(b) 3

(c) 4

(d) 5

(e) 2

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