KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 102 - EXAM I

Sunday – March 25, 2007

Test Code: Code 001 Duration 120 Minutes

Student's Name: ……

ID #: …….. **Section #: ……**

Important Instructions:

1. All types of CALCULATORS, PAGERS, OR MOBILES ARE NOT ALLOWED to be with you during the examination.

2. Use an HB 2 pencil.

3. Use a good eraser. Do not use the eraser attached to the pencil.

4. Write your name, ID number and Mathematics Section on the examination paper and in the upper left corner of the answer sheet.

5. When bubbling your ID number and Math Section number, be sure that bubbles match with the number that you write.

6. The test Code Number is already typed and 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.

9. Check that the exam paper has 20 questions.

1. The **estimated area** under the graph of $f(x) = 20 - 2x^2$ from $x = -2$ to $x = 3$ using **five approximating rectangles** and **right end-points** is

   (a) 70

   (b) 80

   (c) 90

   (d) 75

   (e) 60

2. The volume of the solid obtained by rotating the region bounded by the curves
   $y = \sqrt{x-1},\ y = 0$, and $x = 5$ about x-axis is equal to

   (a) 10π

   (b) 4π

   (c) 6π

   (d) 8π

   (e) 2π

3. The value of $\int_0^1 x(\sqrt[3]{x} + \sqrt[4]{x})dx$ is

(a) $\frac{1}{63}$

(b) $\frac{1}{16}$

(c) $\frac{55}{63}$

(d) $\frac{13}{16}$

(e) $\frac{11}{63}$

4. If $\int_{-1}^{6} f(x)dx = 12$, $\int_{-1}^{4} f(x)dx = 16$ and $\int_{5}^{6} f(x)dx = -18$, then $\int_{4}^{5} f(x)dx$ is equal to

(a) 14

(b) -10

(c) 22

(d) 10

(e) 28

5. The value of $\int_1^2 \frac{6+u+u^2}{u^3} du$ is equal to

(a) $\frac{15}{2}$

(b) $\frac{11}{4} + \ln 2$

(c) $\ln 2 + 4$

(d) $\ln 2 - \frac{5}{6}$

(e) 16

6. The value of the integral $\int_{-\pi}^{\pi} \frac{\sin x}{1+x^2+x^4}\, dx$ is

(a) 1

(b) 0

(c) -1

(d) 2

(e) -2

7. Let $f(x) = \begin{cases} x & \text{f} \quad -\pi \leq x \leq 0 \\ \sin x & \text{if} \quad 0 < x \leq \pi. \end{cases}$ Then the value of $\int_{-\pi}^{\pi} f(x)dx$ is

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

(b) $\dfrac{\pi^2}{2} - 5$

(c) $\dfrac{8-\pi^2}{4}$

(d) $2\pi - \pi^2$

(e) $\dfrac{4-\pi^2}{2}$

8. The integral $\int \dfrac{1+x}{1+x^2}\, dx$ is equal to

(a) $\tan^{-1} x + \dfrac{1}{2}\ln(x^2+1) + C$

(b) $1 + \dfrac{1}{2}\ln(x^2+1) + C$

(c) $\tan^{-1}(x^2+1) + \ln(x^2+1) + C$

(d) $\dfrac{1}{2}\ln(x^2+1) + C$

(e) $\tan^{-1}(\ln(x^2+1)) + C$

9. The value of the integral $\int_0^2 (4+\sqrt{4-x^2})dx$ by interpreting it in terms of areas is

(a) $8+\pi$

(b) $8+\dfrac{\pi}{4}$

(c) $4+2\pi$

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

(e) $6+2\pi$

10. The integral $\int_0^{\pi/2} \pi[(1+\cos x)^2-1^2]dx$ represents the volume of the solid obtained by rotating the region bounded by

(a) $y = 1+\cos x,\ y = 0,\ x = 0,$ and $x = \pi/2$ about the x-axis

(b) $y = 1+\cos x,\ y = 1,\ x = 0,$ and $x = \pi/2$ about the x-axis

(c) $y = (1+\cos x)^2,\ y = 1,\ x = 0,$ and $x = \pi/2$ about the x-axis

(d) $y = 1-\cos x,\ y = 1,\ x = 0,$ and $x = \pi/2$ about the x-axis

(e) $y = 2+\cos x,\ y = 1,\ x = 0,$ and $x = \pi/2$ about the x-axis

11. The area of the region enclosed by the graphs of $x = y + 1$ and $x = (y-1)^2$ is equal to

(a) 6

(b) $\frac{9}{2}$

(c) 4

(d) 5

(e) $\frac{11}{2}$

12. The area of the region enclosed by the graphs of $y = |x|$ and $y = 2 - x^2$ is equal to

(a) $\int_{-1}^{0}(2 + x - x^2)dx + \int_{0}^{1}(2 - x - x^2)dx$

(b) $\int_{-\sqrt{2}}^{\sqrt{2}}(2 - x^2 - x)dx$

(c) $\int_{-1}^{1}(2 - x^2 - x)dx$

(d) $\int_{-1}^{0}(2 - x - x^2)dx + \int_{0}^{1}(2 + x - x^2)dx$

(e) $\int_{-1}^{1}(2 - x^2 + x)dx$

13. Let $y = \int_{\sin x}^{x^2} \tan(u^3)du$. Then $\dfrac{dy}{dx}$ is

(a) $2x\tan(x^6) - \cos x \tan(\sin^3 x)$

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

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

(d) $\tan(x^6) - \tan(\sin^3 x)$

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

14. The value of $\int_e^{e^2} \dfrac{dx}{x \ln x}$ is equal to

(a) 1

(b) e

(c) $\ln 2$

(d) $-1 + \ln 2$

(e) $2\ln 3$

15. The limit $\lim_{t\to 0}(1+2t)^{3/t}$ is equal to

(a) e^6

(b) $e^{3/2}$

(c) 6

(d) $\frac{3}{2}$

(e) e^2

16. The area of the region enclosed by the graphs of $y = \sin x$, $y = \sin 2x$, $x = 0$ and $x = \frac{\pi}{3}$ is equal to

(a) $\sqrt{2} - 1$

(b) $\sqrt{3} - \frac{3}{2}$

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

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

(e) 0

17. The volume of the solid obtained by rotating the region bounded by the curves
$y = x^2$, and $x = y^2$ about the line $x = 1$ is equal to

(a) $\pi \int_0^1 (y^2 - y)dy$

(b) $\pi \int_0^1 ((1 - y^2)^2 - (1 - \sqrt{y})^2)dy$

(c) $\pi \int_0^1 ((1 - y^2)^2 - (1 - y)^2)dy$

(d) $\pi \int_0^1 ((1 - \sqrt{y})^2 - (1 - y)^2)dy$

(e) $\pi \int_0^1 (y^2 - \sqrt{y})^2\, dy$

18. The value of $\int_0^{3\pi/2} |\sin x| dx$ is

(a) 1

(b) 2

(c) -1

(d) 3

(e) 0

19. The value of $\int_1^e \dfrac{\cos(\ln x)}{x}\, dx$ is

(a) $\cos 1$

(b) $\cos(\ln 1)$

(c) $\sin(\ln 1)$

(d) $\sin 1$

(e) $\ln(1+e)$

20. If $G(u) = \int_1^u g(x)dx$ where $g(x) = \int_1^{x^2} \dfrac{\sqrt{9+t^2}}{t}\, dt$, then $G''(2)$ is equal to

(a) 5

(b) $\dfrac{\sqrt{\pi}}{2} - \sqrt{10}$

(c) $\dfrac{\sqrt{\pi}}{2}$

(d) $\sqrt{\pi}$

(e) 25

ANSWER KEY

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