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


Math 102
Major Exam I
Term 123
Tuesday, June 25, 2013
Duration: 120 minutes
CODE 000


Name:..............................................................................................................

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**Check that the exam has 20 questions**


**Calculators and mobile phones are NOT allowed during the
examination.**
**Report your choices on the table below by putting an X in the
appropriate cells**

| Ex# | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|-----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| (a) |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| (b) |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| (c) |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| (d) |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| (e) |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |

Total:..............

1. Let $P$ be a partition of the interval $[-4, 0]$, the value of the limit

$$\lim_{\|P\|\to 0} \sum_{k=1}^{n} \left(1 - 4\sqrt{16 - x_k^2}\right) \Delta x_k$$

is equal to

(a) $4 - 16\pi$

(b) $1 - 16\pi$

(c) $4 - 4\pi$

(d) $4 + 4\pi$

(e) $4 - \pi$

2. If $f$ is integrable, $\int_{-2}^{5} f(x)dx = 7$ and $\int_{-2}^{3} f(x)dx = 5$, then $\int_{3}^{5} f(x)dx$ is equal to

(a) 2

(b) 3

(c) 12

(d) $-2$

(e) $-12$

3. If

$$y = \int_{x^{1/3}}^{0} \sin(t^3) dt$$

then $\frac{dy}{dx}$ is equal to

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

(b) $\frac{1}{3}x^{-\frac{2}{3}} \sin(x)$

(c) $x^{\frac{2}{3}} \sin(x)$

(d) $\frac{3}{2}x^{-\frac{2}{3}} \sin(x)$

(e) $\frac{3}{2}x^{\frac{2}{3}} \sin(x)$

4. The area of the region between the graph of $y = \cos(2x)$ and the $x$-axis between $x = 0$ and $x = \frac{3\pi}{4}$ is

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

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

(c) 1

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

(e) 2

5. The area of the region in the first quadrant enclosed by the curves $y = 2x$, $y = \frac{1}{2}x^2$ , $y = 2$ is equal to

(a) $\frac{5}{3}$

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

(c) $5\sqrt{2}$

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

(e) $\frac{11}{3}$

6. The area of the region bounded by the curves $y = 8x^2$ and $x = y^2$ is equal to

(a) $\frac{1}{24}$

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

(c) $\frac{3}{5}$

(d) $\frac{1}{12}$

(e) $\frac{5\sqrt{2}}{48}$

7. The volume of the solid generated by rotating the region between the $x$−axis and $y = x^2$, $1 \le x \le 2$, about the $x$−axis is equal to

(a) $\frac{31\pi}{5}$

(b) $\frac{33\pi}{5}$

(c) $\frac{32\pi}{5}$

(d) $\frac{29\pi}{5}$

(e) $\frac{30\pi}{5}$

8.  The volume of the solid generated by rotation the region between $y = \frac{1}{x}$ , $y = x^2$ and $x = \frac{1}{2}$ about the $y$−axis is equal to

(a) $\int_{1/4}^{1} \pi \left(y - \frac{1}{4}\right) dy + \int_{1}^{2} \pi \left(\frac{1}{y^2} - \frac{1}{4}\right) dy$

(b) $\int_{1/4}^{1} \pi \left(y - 1\right) dy + \int_{1}^{2} \pi \left(\frac{1}{y^2} - 1\right) dy$

(c) $\int_{1/4}^{1} \pi \left(\frac{1}{y^2} - \frac{1}{4}\right) dy + \int_{1}^{2} \pi \left(y - \frac{1}{4}\right) dy$

(d) $\int_{1/4}^{1} \pi \left(\frac{1}{y^2} - 1\right) dy + \int_{1}^{2} \pi \left(y - 1\right) dy$

(e) $\int_{1/4}^{2} \pi \left(y - \frac{1}{y^2}\right) dy$

9. The region in the first quadrant bounded by the curves $y^2 = x$ and $y = x^3$ is rotated about the $y-$axis, then the volume of the resulting solid is

(a) $\frac{2\pi}{5}$

(b) $\frac{3\pi}{5}$

(c) $\frac{\pi}{5}$

(d) $\frac{6\pi}{5}$

(e) $\frac{22\pi}{5}$

10. The length of the curve $y = 2x^{3/2} + \frac{3}{2}$ from $x = 0$ to $x = 1$ is equal to

(a) $\frac{2}{27}\left(10\sqrt{10} - 1\right)$

(b) $\frac{2}{3}\left(10\sqrt{10} - 1\right)$

(c) $\frac{20\sqrt{10}}{27}$

(d) $\frac{2}{27}\left(10\sqrt{10} + 1\right)$

(e) $\frac{1}{9}\left(10\sqrt{10} - 1\right)$

11. The area of the surface generated by revolving the curve $x = \frac{1}{2}\sqrt{2y-1}$, $1 \le y \le 2$, about the $y-$axis, is equal to

(a) $\int_1^2 \pi\sqrt{2y - \frac{3}{4}}\,dy$

(b) $\int_1^2 \pi\sqrt{8y - 3}\,dy$

(c) $\int_1^2 \pi\sqrt{2y - 1}\,dy$

(d) $\int_1^2 \pi\sqrt{4y - 3}\,dy$

(e) $\int_1^2 2\pi\sqrt{2y - 1}\,dy$

12. The area of the surface generated by revolving the curve $y = \sqrt{x+1}$, $1 \le x \le 3$, about the $x-$axis, is equal to

(a) $\int_1^3 2\pi\sqrt{x + \frac{5}{4}}\,dx$

(b) $\int_1^3 2\pi\sqrt{x + \frac{3}{4}}\,dx$

(c) $\int_1^3 2\pi\sqrt{x + 1}\,dx$

(d) $\int_1^3 2\pi\sqrt{x + \frac{4}{5}}\,dx$

(e) $\int_1^3 2\pi\sqrt{x + \frac{4}{3}}\,dx$

13. The indefinite integral

$$\int e^{x^3 + 2\ln x} dx$$

is equal to

(a) $\frac{1}{3}e^{x^3} + C$

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

(c) $e^{x^3} + \frac{x^3}{3} + C$

(d) $e^{x^2} + x^2 + C$

(e) $\frac{x^3}{3}e^{x^3} + C$

14. The indefinite integral

$$\int \frac{1}{\sqrt{x}} e^{\sqrt{x}} dx$$

is equal to

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

(b) $e^{\sqrt{x}} + C$

(c) $2e^{2\sqrt{x}} + C$

(d) $e^{2\sqrt{x}} + C$

(e) $\ln e^{\sqrt{x}} + C$

15. The definite integral

$$\int_{-1}^{1} \frac{x^2 + \sin x}{x^2 + 1}\,dx$$

is equal to

(a) $2 - \frac{\pi}{2}$

(b) $0$

(c) $2 - \frac{\pi}{4}$

(d) $1 - \frac{\pi}{4}$

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

16. The volume of the solid generated by revolving the region bounded by the curves $y = \frac{1}{x}$ , $y = 0$ , $x = 1$ and $x = 3$ about the line $x = 3$ is equal to

(a) $2\pi\,(3\ln 3 - 2)$

(b) $\pi\ln 3$

(c) $\pi\,(3\ln 3 - 2)$

(d) $2\pi\,(\ln 3 - 2)$

(e) $2\pi\,(3\ln 3 - 1)$

17. Let

$$f(x) = \int_{x^2}^{x^3} e^{t^2} \, dt$$

,

then $f(1) + f'(1)$ is equal to

(a) $\mathbf{e}$

(b) $\pi$

(c) $2\mathbf{e}$

(d) $0$

(e) $\mathbf{e} - 1$

18. The length of the curve $y = (x+1)^{3/2}$ from $x = \frac{1}{3}$ to $x = \frac{4}{3}$ is equal to

(a) $\frac{61}{27}$

(b) $\frac{61}{9}$

(c) $\frac{189}{27}$

(d) $\frac{189}{9}$

(e) $\frac{21}{27}$

19. $\int_0^{\pi/4} \frac{\sin(4x)}{1+\sin^2(2x)} dx =$

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

(b) $\ln 2$

(c) $\pi$

(d) $2 \ln 2$

(e) $\ln \pi$

20. $\int \frac{\cos^{-1}\left(\frac{x}{2}\right)}{\sqrt{4-x^2}} dx =$

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

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

(c) $\ln \left|\cos^{-1}\left(\frac{x}{2}\right)\right| + C$

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

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