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:...
ID:..Sec:..............................

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

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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 $y = x^2$, $1 \leq x \leq 2$, 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

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

,

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

(a) $\mathbf{e}$

(b) π

(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) π

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