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

Math 102
Exam I
Term 112
Tuesday 28/02/2012
Net Time Allowed: 120 minutes

# MASTER VERSION

1. The estimated area under the graph of $f(x) = \frac{1}{2}|x^2 - 3|$ from $x = 0$ to $x = 8$ by using four approximating rectangles and midpoints equals to

(a) 76

(b) 52

(c) 72

(d) 54

(e) 28

2. If the region bounded by the curves $x + y = 2, x = 0, x = 1$, and $y = 0$ is rotated about the $x$-axis, then the volume of the solid generated is equal to

(a) $\frac{7}{3}\pi$

(b) $3\pi$

(c) $\frac{10}{3}\pi$

(d) $5\pi$

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

3. The value of $\lim_{n\to\infty}\sum_{i=1}^{n}\left(2\sqrt{x_i}+\frac{1}{2\sqrt{x_i}}\right)^2 \triangle x$ on the interval $[1,2]$ is equal to

(a) $8+\frac{1}{4}\ln 2$

(b) $8$

(c) $12+\frac{1}{4}\ln 2$

(d) $10$

(e) $10+\ln 2$

4. $\int \frac{5}{x(4+3\ln x)^6}dx =$

(a) $\frac{-1}{3}(4+3\ln x)^{-5}+c$

(b) $3(4+3\ln x)^{-5}+c$

(c) $-15(4+3\ln x)^{5}+c$

(d) $\frac{-5}{3}(4+3\ln x)^{5}+c$

(e) $5(4+\ln x)^{-6}+c$

5. $\int \frac{6x^2 - 13x - 5}{3x + 1} dx =$

(a) $x^2 - 5x + c$

(b) $\frac{1}{3} \ln |3x + 1| + c$

(c) $2x^2 + x + c$

(d) $x^2 + \frac{1}{3} \ln |3x + 1| + c$

(e) $3x^3 - 6x + c$

6. If $f(1) = 9$, $f(8) = 4$, and $g(x) = \frac{f'(x)}{\sqrt{f(x)}}$ is continuous on $[1, 8]$, then $\int_1^8 g(x) dx =$

(a) $-2$

(b) $-5$

(c) $7$

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

(e) $2 - 4\sqrt{2}$

7. $\int_0^{\ln\sqrt{3}} \frac{e^x}{1+e^{2x}} dx =$

(a) $\frac{\pi}{12}$

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

(c) $\frac{\pi}{6}$

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

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

8. If $f$ is an odd continuous function such that $\int_{-2}^{5} f(x)dx = 6$, and $\int_3^5 f(x)dx = 10$, then $\int_2^3 f(x)dx =$

(a) $-4$

(b) 16

(c) $-16$

(d) 10

(e) $-6$

9. $\int_0^{\frac{\pi}{4}} \frac{1-\tan x}{1+\tan x}dx =$

(a) $\frac{1}{2}\ln 2$

(b) $2$

(c) $5$

(d) $-3\ln 2$

(e) $1$

10. If $f(x) = \begin{cases} 2-x, & 0 \le x \le 2 \\ \sqrt{9-(x-5)^2}, & 2 < x \le 8 \end{cases}$,
then using area under curves to evaluate the integral $\int_0^8 f(x)dx$, we get

(a) $2 + \frac{9\pi}{2}$

(b) $2 + 8\pi$

(c) $2 + 2\pi$

(d) $8 + 25\pi$

(e) $2 + 25\pi$

11. $\displaystyle\int_0^{\pi/4} \frac{12}{(\cos^2 x)(1+3\tan x)^{3/2}}dx =$

(a) 4

(b) 6

(c) 3

(d) 2

(e) 1

12. If $f(x) = \displaystyle\int_x^{2x} \frac{e^t}{t}dt$ then $f'(1) =$

(a) $e^2 - e$

(b) $e^2 - 1$

(c) $e + 1$

(d) $\dfrac{e^2}{2} - e$

(e) $e - 1$

13. The volume of the solid obtained by rotating the region bounded by the parabolas $y = x^2$ and $y^2 = x$ about the line $x = 2$ is given by the integral

(a) $\pi \int_0^1 (-4y^2 + y^4 + 4\sqrt{y} - y)dy$

(b) $\pi \int_0^2 (4y^2 - y^4 - 4\sqrt{y} - y)dy$

(c) $\pi \int_0^1 (-4y^2 + y^4 - 4\sqrt{y} - 2y)dy$

(d) $\pi \int_0^2 (-4\sqrt{x} + x - 4x^2 - x^4)dx$

(e) $\pi \int_0^1 (x^2 - x^4)dx$

14. The area of the region enclosed by the curves $y^2 = 4 - x$ and $x + 2y = 1$ is given by the integral

(a) $\int_{-1}^{3} (3 + 2y - y^2)dy$

(b) $\int_{-5}^{3} \left[\frac{1}{2}(1 - x) - \sqrt{4 - x}\right] dx$

(c) $\int_{-1}^{3} (y^2 - 2y - 3)dy$

(d) $\int_{-5}^{4} \left[\frac{1}{2}(1 - x) - \sqrt{4 - x}\right] dx$

(e) $\int_{-3}^{1} (3 - 2y + y^2)dy$

15. If a particle is moving in a straight line with velocity (in cm/s) given by $v(t) = 20(\cos t)(\sin^3 t)$ then the distance traveled by the particle during the time interval $[0, \pi]$ is

(a) 10 cm

(b) 5 cm

(c) 20 cm

(d) 0 cm

(e) 30 cm

16. The base of a solid $S$ is the region enclosed by the curve $y = \sqrt{1 - x^2}$ and the $x$- axis. If the cross sections of $S$ perpendicular to the $x$-axis are squares, then the volume of $S$ is

(a) $\frac{4}{3}$

(b) 4

(c) $\frac{7}{3}$

(d) 3

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

17. An expression for the area under the graph of $f(x) = 2x^2 - 8x$, $4 \le x \le 5$, as a limit and using right endpoints is

(a) $\lim_{n\to\infty} \sum_{i=1}^{n} \left(\frac{8}{n^2}i + \frac{2}{n^3}i^2\right)$

(b) $\lim_{n\to\infty} \sum_{i=1}^{n} \left(\frac{8}{n} - \frac{8}{n^2}i + \frac{2}{n^3}i^2\right)$

(c) $\lim_{n\to\infty} \sum_{i=1}^{n} \left(\frac{16}{n^2}i + \frac{32}{n^3}i^2\right)$

(d) $\lim_{n\to\infty} \sum_{i=1}^{n} \left(\frac{16}{n} - \frac{16}{n^2}i + \frac{4}{n^3}i^2\right)$

(e) $\lim_{n\to\infty} \sum_{i=1}^{n} \left(\frac{8}{n^2}i - \frac{4}{n^3}i^2\right)$

18. If $y = \sqrt{x} \int_3^{\sqrt{x}} \ln t \, dt$, then $2x\frac{dy}{dx} - y =$

(a) $x \ln \sqrt{x}$

(b) $\sqrt{x} \ln \sqrt{x}$

(c) $x + \ln \sqrt{x}$

(d) $\sqrt{x} + \ln \sqrt{x}$

(e) $\ln \sqrt{x}$

19. The area of the region bounded by the curves $y = \frac{4}{x}$ and $y = x$ from $x = 1$ to $x = 4$ is equal to

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

(b) $3 \ln 2$

(c) $\frac{7}{2}$

(d) $\frac{9}{2} + \ln 2$

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

20. If $A = \int_{-3}^{4} \sqrt{25 - x^2}\, dx$, then which one of the following inequalities is **False ?**

(a) $21 \leq A \leq 24$

(b) $21 \leq A \leq 35$

(c) $0 \leq A \leq 35$

(d) $21 \leq A \leq \frac{25\pi}{2}$

(e) $24 \leq A \leq \frac{25\pi}{2}$