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

Math 102
Exam I
Term 091
Tuesday 3/11/2009
Net Time Allowed: 120 minutes

MASTER VERSION

1. Using four rectangles and left endpoints, the area under the graph of $f(x) = x^2 - 2x$ from $x = 2$ to $x = 6$ is approximately equal to

(a) 26

(b) 23

(c) 35

(d) 38

(e) 40

2. $\int (\sqrt[4]{y} + y)^2 \, dy =$

(a) $\frac{2}{3}y^{3/2} + \frac{8}{9}y^{9/4} + \frac{1}{3}y^3 + C$

(b) $\frac{2}{3}y^{3/2} + \frac{4}{9}y^{9/4} + \frac{1}{3}y^3 + C$

(c) $\frac{4}{5}y^{5/4} + \frac{2}{9}y^{9/4} + \frac{1}{3}y^3 + C$

(d) $\frac{1}{2}y^2 + \frac{1}{3}y^3 + C$

(e) $\frac{(\sqrt[4]{y} + y)^3}{3} + C$

3. $\displaystyle\int_{e}^{e^3} \frac{1}{x \ln x}\, dx =$

(a) $\ln 3$

(b) $\ln 2$

(c) $1 - \ln 3$

(d) $-\ln 3$

(e) $2 - \ln 2$

4. $\displaystyle\int_{0}^{2\sqrt{2}} (3 - 2\sqrt{8 - x^2})\, dx =$

(a) $6\sqrt{2} - 4\pi$

(b) $6\sqrt{2} - 2\pi$

(c) $6\sqrt{2} - 8\pi$

(d) $3\sqrt{2} - 2\pi$

(e) $2\sqrt{2}$

5. The volume of the solid generated by rotating the region bounded by the curves

$$x^2 + y^2 = 1 \text{ and } y = |x|$$

about the x-axis is equal to

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

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

(c) $4\sqrt{2}\pi$

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

(e) $\frac{2}{\sqrt{3}}\pi$

6. The area of the region enclosed by the graphs of

$$2y^2 = x + 4 \text{ and } x = y^2$$

is equal to

(a) $\frac{32}{3}$

(b) $\sqrt{3}$

(c) $4\sqrt{2}$

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

(e) 1

7. If $G(x) = \int_{\sin x}^{\cos(3x)} \frac{1}{\sqrt{1+4t^2}}\, dt$, then $G'\left(\frac{\pi}{2}\right) =$

(a) 3

(b) $\frac{16}{5}$

(c) $\frac{-14}{5}$

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

(e) 2

8. $\int_6^4 f(x)dx + \int_4^{-1} f(x)dx - \int_6^{-3} f(x)dx =$

(a) $\int_{-3}^{-1} f(x)dx$

(b) $\int_{-1}^{-3} f(x)dx$

(c) $\int_4^{-3} f(x)dx$

(d) $\int_{-1}^{6} f(x)dx$

(e) $\int_4^{-1} f(x)dx$

9. $\int_1^4 \frac{d}{dx}\left(\frac{\ln x}{\sqrt{x}}\right) dx =$

(a) $\ln 2$

(b) $-1 + \ln 2$

(c) $\ln 4$

(d) $2 + \ln 4$

(e) cannot be evaluated

10. $\int (\tan^2 t - \cot^2 t) dt =$

(a) $\tan t + \cot t + C$

(b) $\sec t + \csc t + C$

(c) $\frac{1}{3}\tan^2 t - \frac{1}{3}\cot^3 t + C$

(d) $t + C$

(e) $t + \tan t + \sec t + C$

11. If R_n is the Riemann sum for

$$f(x) = 3 + \frac{2}{9}x^2, \quad 0 \le x \le 3,$$

with n subintervals and taking sample points to be the right endpoints, then $R_n =$

(a) $9 + \left(1 + \frac{1}{n}\right)\left(2 + \frac{1}{n}\right)$

(b) $3 + \frac{2}{9}\left(1 + \frac{1}{n}\right)\left(2 + \frac{1}{n}\right)$

(c) $9 + \frac{1}{27}\left(1 + \frac{1}{n}\right)\left(2 + \frac{1}{n}\right)$

(d) $1 + \frac{2}{3}\left(1 + \frac{2}{n}\right)\left(2 + \frac{1}{3n}\right)$

(e) $3 + \frac{1}{6}\left(1 - \frac{1}{n}\right)\left(2 + \frac{1}{n}\right)$

12. $\int_0^1 \frac{10x + 15}{\sqrt{2x^2 + 6x + 1}} dx =$

(a) 10

(b) 5

(c) 20

(d) $\frac{5}{2}$

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

13. If the velocity of a particle moving in a straight line is given by

$$v(t) = \frac{1}{2} - \cos t, \quad t \geq 0$$

then the distance traveled during the time inteval $\left[0, \frac{\pi}{2}\right]$ is

(a) $\sqrt{3} - 1 - \frac{\pi}{12}$

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

(c) $\sqrt{3} - 1 + \frac{\pi}{12}$

(d) $2 - \frac{\pi}{6}$

(e) $\sqrt{3} + 1 + \frac{\pi}{12}$

14. $\int_0^1 \frac{\tan^{-1} x}{1 + x^2}\, dx =$

(a) $\frac{\pi^2}{32}$

(b) $\frac{\pi^2}{16}$

(c) $2\pi^2$

(d) $\frac{\pi}{8}$

(e) $\frac{3\pi}{2}$

15. $\int x\sqrt{2x-1}\, dx =$

(a) $\frac{1}{10}(2x-1)^{5/2} + \frac{1}{6}(2x-1)^{3/2} + C$

(b) $\frac{2}{5}(2x-1)^{5/2} + \frac{1}{3}(2x-1)^{3/2} + C$

(c) $\frac{2}{3}(2x-1)^{3/2} + 2(2x-1)^{1/2} + C$

(d) $\frac{\sqrt{2x-1}}{x} + C$

(e) $\frac{1}{10}\left(\frac{x+1}{2}\right)^{5/2} + \frac{2}{3}\left(\frac{x+1}{2}\right)^{1/2} + C$

16. Which one of the following is **TRUE**: If f is an odd and continuous function on $[-a, a]$, then

(a) $\int_{-a}^{a} [f(x)]^3 dx = 0$

(b) $\int_{-a}^{a} [f(x)]^2 dx = 0$

(c) $\int_{-a}^{a} x f(x) dx = 0$

(d) $\int_{-a}^{a} \cos x \cdot f(x) dx = 2\int_{0}^{a} \cos x \cdot f(x) dx$

(e) $\int_{-a}^{a} [\sin x + f(x)] dx = 2\int_{0}^{a} [\sin x + f(x)] dx$

17. The area of the region lying between the curves $y = x^2$ and $y = -x + 2$ and between the lines $x = 0$ and $x = 2$ is equal to

(a) 3

(b) 2

(c) $\frac{5}{2}$

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

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

18. The volume of the solid generated by rotating the region bounded by the curves

$$y = x \text{ and } y = \sqrt{x}$$

about the line $x = 2$ is given by

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

(b) $\int_0^1 \pi[(2 - \sqrt{x})^2 - (2 - x)^2]dx$

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

(d) $\int_0^1 \pi[(\sqrt{x} + 2)^2 - (x + 2)^2]dx$

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

19. If $\int_0^1 f(3x-5)dx = 4$, then $\int_{-5}^{-2} f(x)dx =$

(a) 12

(b) 4

(c) 3

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

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

20. $\lim_{n\to+\infty} \sum_{i=1}^{n} \left[2 + \left(1 + \frac{4i}{n}\right)^7\right] \frac{5}{n} =$

(a) $\int_0^5 \left[2 + \left(1 + \frac{4}{5}x\right)^7\right] dx$

(b) $\int_0^5 \left[2 + (1+4x)^7\right] dx$

(c) $\int_2^7 \left[2 + (1+4x)^7\right] dx$

(d) $\int_2^7 \left[2 + \left(1 + \frac{4}{5}x\right)^7\right] dx$

(e) $\int_0^5 \left(1 + \frac{4}{5}x\right)^7 dx$