King Fahd University of Petroleum and Minerals
Department of Mathematics
Math 102
Major Exam I
Term 252
17 February 2026
Net Time Allowed: 90 Minutes

MASTER VERSION

Question 31/ Section 5.2 Page 303

1. Use the right end points and 3 rectangles to find an approximation of the area of the region between the graph of the function $f(x) = 2x^2 - x - 1$ and the x-axis over the interval $[2, 5]$

(a) 85 _____ (correct)

(b) 86

(c) 87

(d) 88

(e) 84

Question 17 / Section 5.7 Page 362

2. $\int \dfrac{x^2 - 3x + 2}{x + 1}\, dx =$

(a) $\dfrac{x^2}{2} - 4x + 6\ln|x + 1| + C$ _____ (correct)

(b) $x^2 - 2x + 6\ln|x + 1| + C$

(c) $\dfrac{x^2}{2} + 4x - 6\ln|x + 1| + C$

(d) $\dfrac{x^2}{2} + 4x + 3\ln|x + 1| + C$

(e) $\dfrac{x^2}{2} - 4x - 3\ln|x + 1| + C$

Question 75 / Section 5.3 Page 316

3. If the interval $[0, 8]$ is partitioned at $x_0 = 0$, $x_1 = 1$, $x_2 = 3$, $x_3 = 7$ and $x_4 = 8$ with $c_1 = 1$, $c_2 = 2$, $c_3 = 5$ and $c_4 = 8$ (c_i is the sample point in the ith subinterval), then the Riemann sum of $f(x) = x^2 + 3x$ on $[0, 8]$ is equal to

(a) 272 (correct)

(b) 274

(c) 276

(d) 278

(e) 270

Question 55 / Section 5.4 Page 329

4. The average value of the function $f(x) = \sin x$ over the interval $[0, \pi]$ is

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

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

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

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

(e) 0

Question 67 / Section 5.3 Page 315

5. Possible values of a and b such that $\int_a^b \sin x\, dx < 0$ are:

(a) $a = \frac{\pi}{2}$, $b = 2\pi$ (correct)

(b) $a = 0$, $b = \frac{\pi}{2}$

(c) $a = \frac{\pi}{2}$, $b = \frac{3\pi}{2}$

(d) $a = 0$, $b = \frac{3\pi}{2}$,

(e) $a = \frac{\pi}{2}$, $b = \pi$

Question 21 / Section 5.4 Page 328

6. $\int_0^5 |2x - 5|\, dx =$

(a) $\frac{25}{2}$ (correct)

(b) $\frac{23}{2}$

(c) $\frac{21}{2}$

(d) $\frac{19}{2}$

(e) $\frac{27}{2}$

Question 83 / Section 5.4 Page 330

7. If $F(x) = \int_0^{\sin x} \sqrt{t}\, dt$, then $F'\left(\frac{\pi}{6}\right) =$

(a) $\frac{\sqrt{6}}{4}$ (correct)

(b) $\frac{\sqrt{6}}{2}$

(c) $\frac{\sqrt{6}}{3}$

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

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

Question 23 / Section 7.1 Page 450

8. The area of the region bounded by the graphs of the equations $x = y^2$, and $x = y+2$ is

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

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

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

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

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

Question 58 / Section 5.9 Page 381

9. $\int_{\frac{1}{2}}^{1} \operatorname{sech}^2(2x-1)\,dx =$

(a) $\frac{1}{2}\tanh 1$ (correct)

(b) $\tanh 1$

(c) $\frac{1}{2}\operatorname{sech} 1$

(d) $\operatorname{sech} 1$

(e) $\frac{1}{2}\coth 1$

Question 20 / Section 7.1 Page 450

10. The area of the region bounded by the graphs of $f(x) = \frac{-4}{x^3}$, $y = 0$, $x = -3$, and $x = -1$ is

(a) $\frac{16}{9}$ (correct)

(b) $\frac{25}{9}$

(c) $\frac{9}{16}$

(d) $\frac{9}{25}$

(e) $\frac{9}{4}$

Question 44 / Section 5.2 Page 304

11. The lower sum (in terms of n, which is the number of equal subintervals), for the region bounded by the graph of the function $f(x) = 9 - x^2$ and the x-axis on the interval $[0, 2]$ is:

(a) $\dfrac{46}{3} - \dfrac{4}{n} - \dfrac{4}{3n^2}$ (correct)

(b) $\dfrac{46}{3} + \dfrac{4}{n} - \dfrac{4}{3n^2}$

(c) $\dfrac{46}{3} + \dfrac{4}{n} + \dfrac{2}{3n^2}$

(d) $\dfrac{46}{3} - \dfrac{4}{n} + \dfrac{2}{3n^2}$

(e) $\dfrac{23}{3} + \dfrac{4}{n} + \dfrac{2}{3n^2}$

Question 58 / Section 5.7 Page 363

12. $\displaystyle\int_{\frac{\pi}{8}}^{\frac{\pi}{4}} (\csc 2\theta - \cot 2\theta)\, d\theta =$

(a) $\dfrac{1}{2}\ln\left(1 + \dfrac{\sqrt{2}}{2}\right)$ (correct)

(b) $\ln\left(1 + \dfrac{\sqrt{2}}{2}\right)$

(c) $\dfrac{1}{2}\ln\left(1 + \sqrt{2}\right)$

(d) $\ln(1 + \sqrt{2})$

(e) $\dfrac{1}{2}\ln\left(1 + \dfrac{\sqrt{2}}{4}\right)$

Question 65 / Section 5.5 Page 342

13. $\int x\sqrt{x+6}\,dx =$

(a) $\frac{2}{5}(x+6)^{\frac{3}{2}}(x-4)+C$ (correct)

(b) $\frac{1}{5}(x+6)^{\frac{3}{2}}(x-4)+C$

(c) $\frac{2}{5}(x+6)^{\frac{1}{2}}(x-4)+C$

(d) $\frac{2}{5}(x+6)^{\frac{3}{2}}(x+4)+C$

(e) $\frac{1}{5}(x+6)^{\frac{3}{2}}(x+4)+C$

Question 39 / Section 5.8 Page 370

14. $\int \frac{1}{\sqrt{-x^2-4x}}\,dx =$

(a) $\arcsin\left(\frac{x+2}{2}\right)+C$ (correct)

(b) $\arcsin\left(\frac{x+4}{2}\right)+C$

(c) $\arccos\left(\frac{x+2}{2}\right)+C$

(d) $\arccos\left(\frac{x+4}{2}\right)+C$

(e) $\arcsin(x+2)+C$