King Fahd University of Petroleum and Minerals
Department of Mathematics
MATH 102
Major Exam I
Term 251
01 October 2025
Net Time Allowed: 90 Minutes

MASTER VERSION

Question 33 / Section 5.3 Page 314

1. $\int_{-1}^{1} (1 - |x|)\, dx =$

(a) 1 (correct)

(b) 2

(c) 3

(d) 4

(e) 8

Question 46 / Section 5.4 Page 328

2. The value of c guaranteed by the Mean Value Theorem for integrals for the function $f(x) = \sqrt{x}$ over the interval $[1, 4]$ is

(a) $\frac{196}{81}$ (correct)

(b) $\frac{144}{81}$

(c) $\frac{196}{9}$

(d) $\frac{144}{9}$

(e) $\frac{49}{9}$

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3. If $F(x) = \int_0^{x^3} \sin t^2\, dt$, then $\sqrt[3]{\frac{6}{\pi}}\, F'\left(\sqrt[6]{\frac{\pi}{6}}\right) =$

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

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

(c) 3

(d) 2

(e) 1

Question 24 / Section 5.5 Page 341

4. $\int \frac{x^3}{\sqrt{1+x^4}}\, dx =$

(a) $\frac{1}{2}\sqrt{1+x^4} + C$ (correct)

(b) $\sqrt{1+x^4} + C$

(c) $\frac{1}{4}\sqrt{1+x^4} + C$

(d) $\frac{1}{2}\ln(1+x^4) + C$

(e) $2\sqrt{1+x^4} + C$

Question 22 / Section 5.7 Page 362

5. $\int \dfrac{x^3 - 4x^2 - 4x + 20}{x^2 - 5}\, dx =$

(a) $\dfrac{x^2}{2} - 4x + \dfrac{1}{2}\ln|x^2 - 5| + C$ (correct)

(b) $x^2 - 2x + \dfrac{1}{2}\ln|x^2 - 5| + C$

(c) $\dfrac{x^2}{2} + 4x + \dfrac{1}{2}\ln|x^2 - 5| + C$

(d) $x^2 + 2x + \dfrac{1}{2}\ln|x^2 - 5| + C$

(e) $\dfrac{x^2}{2} - 4x - \dfrac{1}{2}\ln|x^2 - 5| + C$

Question 37 / Section 5.8 Page 370

6. $\int \dfrac{dx}{\sqrt{-2x^2 + 8x + 4}} =$

(a) $\dfrac{\sqrt{2}}{2}\arcsin\left[\dfrac{\sqrt{6}}{6}(x-2)\right] + C$ (correct)

(b) $\sqrt{2}\arcsin\left[\dfrac{\sqrt{6}}{6}(x-2)\right] + C$

(c) $\dfrac{\sqrt{2}}{2}\arcsin\left[\dfrac{\sqrt{6}}{6}(x+2)\right] + C$

(d) $\sqrt{2}\arcsin\left[\dfrac{\sqrt{6}}{6}(x+2)\right] + C$

(e) $\dfrac{\sqrt{2}}{2}\arcsin(x-2) + C$

Question 60 / Section 5.9 Page 381

7. $\int_0^{\ln 2} 2e^{-x}\cosh x\,dx =$

(a) $\frac{3}{8}+\ln 2$ (correct)

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

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

(d) $\frac{3}{8}+\ln 3$

(e) $\frac{1}{8}+\ln 3$

Question 19 / Section 7.1 Page 450

8. The area of the region bounded by the graphs of the equations $f(x)=\frac{1}{9x^2}$, $y=1$, $x=1$ and $x=2$ is

(a) $\frac{17}{18}$ (correct)

(b) $\frac{15}{16}$

(c) $\frac{18}{17}$

(d) $\frac{16}{15}$

(e) 1

Question 21 / Section 7.1 Page 450

9. The area of the region bounded by the graphs of the functions $f(x) = x^3 + 2$ and $g(x) = x + 2$ is

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

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

(c) 1

(d) 2

(e) 4

Question 66 / Section 5.3 Page 315

10. If $\int_{-3}^{3} f(x)\,dx + \int_{3}^{6} f(x)\,dx - \int_{a}^{b} f(x)\,dx = \int_{-1}^{6} f(x)\,dx$, for any integrable function $f(x)$, then $b - a =$

(a) 2 (correct)

(b) -2

(c) -1

(d) 1

(e) 0

Question 43 / Section 5.2 Page 304

11. The upper sum (in terms of n, the number of subintervals) for the region bounded by the graph of function $f(x) = 5x^2$ and the x-axis on the interval $[0, 1]$ is

(a) $\frac{5}{3} + \frac{5}{2n} + \frac{5}{6n^2}$ (correct)

(b) $\frac{5}{6} + \frac{5}{2n} + \frac{5}{6n^2}$

(c) $\frac{5}{3} + \frac{5}{3n} + \frac{5}{6n^2}$

(d) $\frac{5}{3} + \frac{5}{2n} + \frac{5}{3n^2}$

(e) $\frac{5}{3} + \frac{5}{2n} + \frac{5}{2n^2}$

Question 64 / Section 5.2 Page 304

12. Use the midpoint rule and 4 rectangles to find an approximation of the area of the region bounded by the graph of the function $f(x) = x^2 + 4x$ and the x-axis over the interval $[0, 4]$. The approximated area is

(a) 53 (correct)

(b) 54

(c) 55

(d) 56

(e) 57

Question 94 / Section 5.4 Page 330

13. Let the velocity function $v(t) = t^2 - t - 12$ in feet per second, be given for a particle moving along a straight line, where t is the time in seconds. The total distance (in feet) that the particle travels over the interval $[0, 5]$ is equal to

(a) $\frac{77}{2}$ (correct)

(b) $\frac{75}{2}$

(c) $\frac{73}{2}$

(d) $\frac{79}{2}$

(e) $\frac{71}{2}$

Question 40 / Section 5.7 Page 362

14. $\int \frac{\sec(2\ln t) + \tan(2\ln t)}{t}\, dt =$

(a) $-\frac{1}{2}\ln|1 - \sin(2\ln t)| + C$ (correct)

(b) $\ln|1 - \sin(2\ln t)| + C$

(c) $\frac{1}{2}\ln|1 - \sin(2\ln t)| + C$

(d) $-\ln|1 - \sin(2\ln t)| + C$

(e) $\frac{1}{4}\ln|1 - \sin(2\ln t)| + C$