King Fahd University of Petroleum and Minerals
Department of Mathematics
Math 102
Major Exam I
243
03 July 2025
Net Time Allowed: 90 Minutes

MASTER VERSION

Question 22 / Review Chapter 5 Page 383

1. The upper sum (in terms of n, the number of subintervals) for the region bounded by the graph of the function $f(x) = 7x^2$ and the x-axis on the interval $[0, 3]$ is:

(a) $63 + \dfrac{189}{2n} + \dfrac{63}{2n^2}$ (correct)

(b) $63 - \dfrac{189}{2n} + \dfrac{63}{2n^2}$

(c) $63 + \dfrac{189}{2n} - \dfrac{63}{2n^2}$

(d) $189 + \dfrac{63}{2n} + \dfrac{63}{2n^2}$

(e) $189 - \dfrac{63}{2n} - \dfrac{63}{2n^2}$

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2. Use the midpoint and 4 rectangles to find an approximation of the area of the region bounded by the graph of the function $f(x) = 16 - x^2$ and the x-axis over the interval $[0, 4]$, then the approximated area is

(a) 43 (correct)

(b) 45

(c) 47

(d) 49

(e) 41

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3. $\lim_{n\to\infty} \frac{1}{n^3}(1^2 + 2^2 + 3^2 + \ldots + n^2) =$

(a) $\frac{1}{3}$ (correct)

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

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

(d) $\frac{1}{5}$

(e) $\frac{1}{6}$

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4. $\int_0^2 [\![x]\!]\, dx =$
(Hint: find the area under the curve over $[0, 2]$)

(a) 1 (correct)

(b) 2

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

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

(e) 3

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5. The average value of the function $f(x) = \dfrac{4(x^2+1)}{x^2}$ over $[1,3]$ is equal to:

(a) $\dfrac{16}{3}$ (correct)

(b) $\dfrac{14}{3}$

(c) $\dfrac{13}{3}$

(d) $\dfrac{11}{3}$

(e) $\dfrac{17}{3}$

Question 86 / Section 5.4 Page 330

6. If $F(x) = \int_0^{2x} \cos t^4 \, dt$, then $F'\left(\dfrac{\sqrt[4]{\frac{\pi}{3}}}{2}\right) =$

(a) 1 (correct)

(b) 2

(c) 4

(d) 8

(e) 16

Question 98 / Section 5.4 Page 330

7. Let the velocity function $v(t) = \cos t$ 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 $[0, 2\pi]$ is equal to

(a) 4 (correct)

(b) 3

(c) 2

(d) 0

(e) 1

Question 17 / Section 7.1 Page 450

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

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

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

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

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

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

Question 99 / Section 5.5 Page 343

9. $\int_{-3}^{3} (x^3 + 4x^2 - 3x - 6)\, dx =$

(a) 36 (correct)

(b) 25

(c) 16

(d) 9

(e) 49

Question 41 / Section 5.7 Page 362

10. $\int e^{-x} \tan(e^{-x})\, dx =$

(a) $\ln|\cos(e^{-x})| + C$ (correct)

(b) $\ln|\sin(e^{-x})| + C$

(c) $\ln|\csc(e^{-x})| + C$

(d) $\ln|\sec(e^{-x})| + C$

(e) $\ln|\tan(e^{-x})| + C$

Question 18 / Section 5.7 Page 362

11. $\displaystyle\int \frac{2x^2+7x-3}{x-2}\,dx =$

(a) $x^2+11x+19\ln|x-2|+C$ _____ (correct)

(b) $x^2+11x-19\ln|x-2|+C$

(c) $x^2-11x+19\ln|x-2|+C$

(d) $x^2-19\ln|x-2|+C$

(e) $x^2+11x+C$

Question 40 / Section 5.8 Page 370

12. $\displaystyle\int \frac{2\,dx}{\sqrt{-x^2+4x}} =$

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

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

(c) $2\arcsin(x-2)+C$

(d) $\arcsin(x-2)+C$

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

Question 50 / section 5.9 Page 380

13. $\displaystyle\int \frac{\sinh x}{1+\sinh^2 x}\,dx =$

(a) $-\operatorname{sech} x + C$ (correct)

(b) $\operatorname{sech} x + C$

(c) $-\operatorname{csch} x + C$

(d) $\operatorname{csch} x + C$

(e) $\cosh x + C$

Example 3 / Section 7.1 Page 446

14. The area of the region bounded by the graphs of the functions $f(x) = \sin x$ and $g(x) = \cos x$ over $[0, \pi]$ is equal to

(a) $2\sqrt{2}$ (correct)

(b) $\sqrt{2}$

(c) $3\sqrt{2}$

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

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