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

MASTER VERSION

Question 7 / Section 7.2 Page 461

1. The volume of the solid found by revolving the region bounded by the graphs of $y = x^5$, $y = x^2$ about the x-axis is

(a) $\frac{6\pi}{55}$ (correct)

(b) $\frac{3\pi}{55}$

(c) $\frac{2\pi}{55}$

(d) $\frac{4\pi}{55}$

(e) $\frac{7\pi}{55}$

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2. The volume of the solid formed by revolving the region bounded by the graphs of $y = \sqrt{x}$, $y = 0$, $x = 4$ about the y-axis is

(a) $\frac{128\pi}{5}$ (correct)

(b) $\frac{64\pi}{3}$

(c) $\frac{128\pi}{3}$

(d) $\frac{64\pi}{5}$

(e) $\frac{128\pi}{7}$

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3. $\displaystyle\int \frac{e^x}{(e^x-1)(e^x+4)}\,dx =$

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

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

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

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

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

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4. The area of the surface generated by revolving the curve $y=\sqrt{4-x^2}$ on the interval $[-1,1]$ about the x-axis is

(a) $8\,\pi$ (correct)

(b) $7\,\pi$

(c) $9\,\pi$

(d) $10\,\pi$

(e) $11\,\pi$

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5. $\int x^5 \ln(3x)\, dx =$

(a) $\frac{x^6}{6}\ln(3x) - \frac{x^6}{36} + C$ (correct)

(b) $\frac{x^5}{5}\ln(3x) - \frac{x^5}{36} + C$

(c) $\frac{x^6}{6}\ln(3x) - \frac{x^6}{6} + C$

(d) $\frac{x^6}{6}\ln x - \frac{x^6}{36} + C$

(e) $\frac{x^6}{36}\ln(3x) - \frac{x^6}{6} + C$

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6. $\int \ln(4+x^2)\, dx =$

(a) $x\ln(4+x^2) - 2x + 4\arctan\left(\frac{x}{2}\right) + C$ (correct)

(b) $x^2\ln(4+x^2) - 2x + 4\arctan\left(\frac{x}{2}\right) + C$

(c) $x\ln(4+x^2) + 2x + 4\arctan\left(\frac{x}{2}\right) + C$

(d) $x\ln(4+x^2) - 2x + \arctan\left(\frac{x}{2}\right) + C$

(e) $x\ln(4+x^2) + 2x + 4\arctan x + C$

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7. $\int \cos^3 x \sin^4 x \, dx =$

(a) $\frac{\sin^5 x}{5} - \frac{\sin^7 x}{7} + C$ (correct)

(b) $\frac{\sin^4 x}{4} - \frac{\sin^6 x}{6} + C$

(c) $\frac{\cos^5 x}{5} - \frac{\cos^7 x}{7} + C$

(d) $\frac{\cos^4 x}{4} - \frac{\cos^6 x}{6} + C$

(e) $\frac{\sin^5 x}{5} - \frac{\cos^7 x}{7} + C$

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8. $\int \tan^5 x \sec^4 x \, dx =$

(a) $\frac{\tan^8 x}{8} + \frac{\tan^6 x}{6} + C$ (correct)

(b) $\frac{\tan^7 x}{7} + \frac{\tan^5 x}{5} + C$

(c) $\frac{\sec^8 x}{8} + \frac{\sec^6 x}{6} + C$

(d) $\frac{\sec^7 x}{7} + \frac{\sec^5 x}{5} + C$

(e) $\frac{\tan^8 x}{8} + \frac{\sec^6 x}{6} + C$

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9. If $\dfrac{x^2-6x+2}{x^3+2x^2+x} = \dfrac{A}{x} + \dfrac{B}{x+1} + \dfrac{C}{(x+1)^2}$, then $A+B+C =$

(a) -8 (correct)

(b) -7

(c) -6

(d) -9

(e) -10

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10. $\displaystyle\int \frac{dx}{(16-x^2)^{\frac{3}{2}}} =$

(a) $\dfrac{1}{16}\left(\dfrac{x}{\sqrt{16-x^2}}\right)+C$ (correct)

(b) $\dfrac{1}{8}\left(\dfrac{x}{\sqrt{16-x^2}}\right)+C$

(c) $\dfrac{1}{4}\left(\dfrac{x}{\sqrt{16-x^2}}\right)+C$

(d) $\dfrac{x}{\sqrt{16-x^2}}+C$

(e) $\dfrac{1}{2}\left(\dfrac{x}{\sqrt{16-x^2}}\right)+C$

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11. The arc length of the graph of the function $f(x) = \dfrac{x^4}{8} + \dfrac{1}{4x^2}$ over the interval $[1, 2]$ is

(a) $\dfrac{33}{16}$ (correct)

(b) $\dfrac{35}{16}$

(c) $\dfrac{31}{16}$

(d) $\dfrac{29}{16}$

(e) $\dfrac{27}{16}$

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

(a) $\dfrac{1}{2}\arctan\left(\dfrac{x}{2}\right) - \dfrac{x}{x^2+4} + C$ (correct)

(b) $\dfrac{1}{4}\arctan\left(\dfrac{x}{2}\right) - \dfrac{x}{x^2+4} + C$

(c) $\dfrac{1}{2}\arctan\left(\dfrac{x}{2}\right) + \dfrac{x}{x^2+4} + C$

(d) $\dfrac{1}{2}\arctan\left(\dfrac{x}{2}\right) + \dfrac{2x}{x^2+4} + C$

(e) $\dfrac{1}{4}\arctan\left(\dfrac{x}{2}\right) + \dfrac{x}{x^2+4} + C$

Question 57 / Section 8.7 Page 571

13. $\displaystyle\int_0^{\frac{\pi}{2}} \frac{d\theta}{1+\sin\theta+\cos\theta} =$

(a) $\ln 2$ (correct)

(b) $\ln 3$

(c) $2\ln 2$

(d) $2\ln 3$

(e) 2

Question 41 / Section 8.1 Page 520

14. $\displaystyle\int \frac{\tan\left(\frac{2}{t}\right)}{t^2}\,dt =$

(a) $\displaystyle\frac{1}{2}\ln\left|\cos\left(\frac{2}{t}\right)\right| + C$ (correct)

(b) $\displaystyle\frac{1}{2}\ln\left|\sec\left(\frac{2}{t}\right)\right| + C$

(c) $\displaystyle\ln\left|\cos\left(\frac{2}{t}\right)\right| + C$

(d) $\displaystyle\ln\left|\sec\left(\frac{2}{t}\right)\right| + C$

(e) $\displaystyle\frac{1}{4}\ln\left|\sec\left(\frac{2}{t}\right)\right| + C$