

King Fahd University of Petroleum and Minerals
Department of Mathematics
Math 102
Major Exam II
Term 252
April 14, 2026
Net Time Allowed: 90 Minutes

MASTER VERSION

Question 14 / Section 8.5 Page 557

1. $\int \frac{8x}{x^3 + x^2 - x - 1} dx =$

(a) $2 \ln \left| \frac{x-1}{x+1} \right| - \frac{4}{x+1} + C$ _____(correct)

(b) $\ln \left| \frac{x-1}{x+1} \right| - \frac{4}{x+1} + C$

(c) $2 \ln \left| \frac{x-1}{x+1} \right| + \frac{4}{x+1} + C$

(d) $\ln \left| \frac{x-1}{x+1} \right| + \frac{4}{x+1} + C$

(e) $2 \ln \left| \frac{x+1}{x-1} \right| - \frac{4}{x+1} + C$

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2. The area of the surface generated by revolving the curve $y = 2\sqrt{x}$ on the interval $[4, 9]$ about the x -axis is

(a) $\frac{8\pi}{3} (10\sqrt{10} - 5\sqrt{5})$ _____(correct)

(b) $\frac{4\pi}{3} (10\sqrt{10} - 5\sqrt{5})$

(c) $\frac{2\pi}{3} (10\sqrt{10} - 5\sqrt{5})$

(d) $\frac{8\pi}{3} (10\sqrt{10} + 5\sqrt{5})$

(e) $\frac{4\pi}{3} (10\sqrt{10} + 5\sqrt{5})$

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

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

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

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

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

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

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4. If $\frac{x^2+6x+4}{x^4+8x^2+16} = \frac{Ax+B}{x^2+4} + \frac{Cx+D}{(x^2+4)^2}$, then $A+B+C+D =$

(a) 7 _____(correct)

(b) 8

(c) 9

(d) 10

(e) 6

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5. $\int t \csc t \cot t \, dt =$

- (a) $-t \csc t - \ln |\csc t + \cot t| + C$ _____(correct)
- (b) $t \csc t - \ln |\csc t + \cot t| + C$
- (c) $-t \csc t + \ln |\csc t + \cot t| + C$
- (d) $t \csc t + \ln |\csc t + \cot t| + C$
- (e) $-t \csc t - 2 \ln |\csc t + \cot t| + C$

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

- (a) $\frac{1}{8} \tan^8 x + \frac{1}{6} \tan^6 x + C$ _____(correct)
- (b) $\frac{1}{7} \tan^7 x + \frac{1}{5} \tan^5 x + C$
- (c) $\frac{1}{8} \tan^8 x - \frac{1}{6} \tan^6 x + C$
- (d) $\frac{1}{7} \tan^7 x - \frac{1}{5} \tan^5 x + C$
- (e) $\tan^8 x + \tan^6 x + C$

Question 9 / Section 8.3 Page 538

7. $\int \sin^3 2\theta \sqrt{\cos 2\theta} d\theta =$

(a) $-\frac{1}{3}(\cos 2\theta)^{3/2} + \frac{1}{7}(\cos 2\theta)^{7/2} + C$ _____(correct)

(b) $\frac{1}{3}(\cos 2\theta)^{3/2} + \frac{1}{7}(\cos 2\theta)^{7/2} + C$

(c) $\frac{2}{3}(\cos 2\theta)^{3/2} + \frac{1}{7}(\cos 2\theta)^{7/2} + C$

(d) $-\frac{1}{3}(\cos 2\theta)^{3/2} + \frac{2}{7}(\cos 2\theta)^{7/2} + C$

(e) $-\frac{1}{3}(\cos 2\theta)^{3/2} - \frac{1}{7}(\cos 2\theta)^{7/2} + C$

Question 38 / Section 8.1 Page 520

8. $\int \frac{d\theta}{\cos \theta - 1} =$

(a) $\csc \theta + \cot \theta + C$ _____(correct)

(b) $-\csc \theta + \cot \theta + C$

(c) $-\csc \theta - \cot \theta + C$

(d) $\csc \theta - \cot \theta + C$

(e) $\csc \theta + 2 \cot \theta + C$

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9. The volume of the solid generated by revolving the region bounded by the graphs of

$y = \sqrt{1-x}$, $x = 0$, $y = 0$ about the line $y = 4$ is

- (a) $\frac{29\pi}{6}$ _____(correct)
- (b) $\frac{25\pi}{6}$
- (c) $\frac{31\pi}{6}$
- (d) $\frac{35\pi}{6}$
- (e) $\frac{23\pi}{6}$

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10. The volume of the solid formed by revolving the region bounded by the graphs of $y = x^3$, $y = 8$, $x = 0$ about the y axis is

- (a) $\frac{96\pi}{5}$ _____(correct)
- (b) $\frac{32\pi}{5}$
- (c) $\frac{16\pi}{5}$
- (d) $\frac{48\pi}{5}$
- (e) $\frac{68\pi}{5}$

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$$11. \int \frac{x^3 e^{x^2}}{(x^2 + 1)^2} dx =$$

(a) $\frac{e^{x^2}}{2(x^2 + 1)} + C$ _____(correct)

(b) $\frac{2e^{x^2}}{x^2 + 1} + C$

(c) $\frac{e^{x^2}}{x^2 + 1} + C$

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

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

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

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

(b) $\arcsin \frac{x}{2} - \sqrt{4x - x^2} + C$

(c) $2 \arcsin \frac{x - 2}{2} + \sqrt{4x - x^2} + C$

(d) $\arcsin \frac{x - 2}{2} + \sqrt{4x - x^2} + C$

(e) $2 \arcsin \frac{x - 2}{2} - 2\sqrt{4x - x^2} + C$

Question 18 / Section 7.4 Page 481

13. The arc length of the graph of the function $f(x) = \ln \left(\frac{e^x + 1}{e^x - 1} \right)$ over the interval $[\ln 6, \ln 8]$ is

- (a) $\ln \frac{27}{20}$ _____(correct)
- (b) $\ln \frac{23}{20}$
- (c) $\ln \frac{29}{20}$
- (d) $\ln \frac{19}{20}$
- (e) $\ln \frac{17}{20}$

Question 55 / Section 8.7 Page 571

14. $\int \frac{d\theta}{2 - 3 \sin \theta} =$

- (a) $\frac{1}{\sqrt{5}} \ln \left| \frac{2 \tan \left(\frac{\theta}{2} \right) - 3 - \sqrt{5}}{2 \tan \left(\frac{\theta}{2} \right) - 3 + \sqrt{5}} \right| + C$ _____(correct)
- (b) $\ln \left| \frac{2 \tan \left(\frac{\theta}{2} \right) - 3 - \sqrt{5}}{2 \tan \left(\frac{\theta}{2} \right) - 3 + \sqrt{5}} \right| + C$
- (c) $\frac{1}{\sqrt{5}} \ln \left| \frac{\tan \left(\frac{\theta}{2} \right) - 3 - \sqrt{5}}{\tan \left(\frac{\theta}{2} \right) - 3 + \sqrt{5}} \right| + C$
- (d) $\ln \left| \frac{\tan \left(\frac{\theta}{2} \right) - 3 - \sqrt{5}}{\tan \left(\frac{\theta}{2} \right) - 3 + \sqrt{5}} \right| + C$
- (e) $\frac{1}{\sqrt{5}} \ln \left| \frac{2 \tan \left(\frac{\theta}{2} \right) - 3 + \sqrt{5}}{2 \tan \left(\frac{\theta}{2} \right) - 3 - \sqrt{5}} \right| + C$