

1. Find the volume of the solid obtained by rotating the region bounded by $y = x^3$ and $x = y^3$ about the x axis.

Select the correct answer.

- a. $\frac{16}{35}\pi$
- b. $\frac{16}{7}\pi$
- c. $\frac{18}{35}$
- d. $\frac{7}{2}$
- e. 16π

2. Use the method of cylindrical shells to find the volume generated by rotating the region bounded by the given curves about the y-axis.

$$y = \frac{1}{x}, y = 0, x = 1, x = 6$$

Select the correct answer.

- a. $V = 10\pi$
- b. $V = 5\pi$
- c. $V = 11\pi$
- d. $V = 4\pi$
- e. $V = \pi$

- 1 a
- 2 a
- 3 b
- 4 a
- 5 d
- 6 c
- 7 d
- 8 d
- 9 a
- 10 c
- 11 a,d
- 12 b
- 13 c
- 14 a
- 15 d
- 16 a
- 17 d
- 18 c
- 19 d
- 20 b
- 21 b

3 Evaluate the integral.

$$\int \sin^2 x \cos^5 x \, dx$$

Select the correct answer.

- a. $-\sin^3 x + \sin^5 x - \sin^7 x + C$
- b. $\frac{1}{3}\sin^3 x - \frac{2}{5}\sin^5 x + \frac{1}{7}\sin^7 x + C$
- c. $-\frac{1}{3}\sin^3 x + \frac{2}{5}\sin^5 x - \frac{1}{7}\sin^7 x + C$
- d. $\sin^3 x - \sin^5 x + \sin^7 x + C$
- e. $-\sin^3 x + \frac{2}{5}\sin^5 x - \sin^7 x + C$

4 Evaluate the following integral if it is convergent.

$$I = \int_0^{\infty} e^{-2x} \, dx$$

Select the correct answer.

- a. $I = \frac{1}{2}$
- b. $I = 2$
- c. $I = -2$
- d. $I = -\frac{1}{2}$
- e. the integral is divergent

5 Evaluate the integral.

$$\int_0^4 (x^2 + 1) e^{-x} dx$$

Select the correct answer.

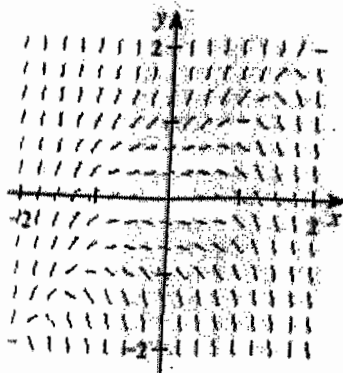
- a. $-27e^4 + 3$
- b. $-27e^{-4} - 1$
- c. $27e^{-4} + 3$
- d. $-27e^{-4} + 3$
- e. none of these

6 Which equation does the function $y = e^{-3t}$ satisfy?

Select the correct answer.

- a. $y'' + y' + 12y = 0$
- b. $y'' + y' - 12y = 0$
- c. $y'' - y' - 12y = 0$
- d. $y'' - y' + 12y = 0$
- e. $y'' - 3y' + 12y = 0$

7 Choose the differential equation corresponding to this direction field.



Select the correct answer.

- a. $y' = y^2 - x^2$
- ~~b. $y' = y - 1$~~ (ignore)
- c. $y' = y - 1$
- d. $y' = y^3 - x^3$
- e. $y' = 2y^3 + x^3$

9 Solve the differential equation.

$$\frac{dy}{dx} = \frac{e^{2x}}{6y^5}$$

Select the correct answer.

a. $y = \pm \sqrt[6]{\frac{e^{2x}}{2}}$

b. $y = \pm \sqrt[6]{e^{2x}}$

c. $y = \pm \sqrt[6]{e^{2x} + C}$

d. $y = \pm \sqrt[6]{\frac{e^{6x}}{2} + C}$

e. $y = \pm \sqrt[5]{\frac{e^{2x}}{2}}$

9 Write out the form of the partial fraction decomposition of the expression. Do not determine the numerical values of the coefficients.

$$\frac{15 - 5x}{(x - 5)^3(x^2 + 9)(2x^2 + 5x + 7)^2}$$

Select the correct answer.

a. $\frac{A}{x - 5} + \frac{B}{(x - 5)^2} + \frac{C}{(x - 5)^3} + \frac{Dx + E}{x^2 + 9} + \frac{Fx + G}{2x^2 + 5x + 7} + \frac{Hx + I}{(2x^2 + 5x + 7)^2}$

b. $\frac{A}{(x - 5)^3} + \frac{Dx + E}{x^2 + 9} + \frac{Fx + G}{(2x^2 + 5x + 7)^2}$

c. $\frac{A}{x - 5} + \frac{Bx + C}{(x - 5)^2} + \frac{Dx^2 + Ex + F}{(x - 5)^3} + \frac{Gx + E}{x^2 + 9} + \frac{Hx + I}{2x^2 + 5x + 7} + \frac{Jx^2 + Kx + L}{(2x^2 + 5x + 7)^2}$

d. $\frac{A}{x - 5} + \frac{Bx + C}{x^2 + 9} + \frac{Dx + E}{2x^2 + 5x + 7}$

10 Evaluate the integral:

$$\int \frac{x^3}{\sqrt{x^2+25}} dx$$

Select the correct answer.

a. $-\frac{2}{3}(x^2+25)^{3/2} + x^2\sqrt{x^2+25} + C$

b. $(x^2+25)^{3/2} - 5\sqrt{x^2+25} + C$

c. $\frac{1}{3}(x^2+25)^{3/2} - 25\sqrt{x^2+25} + C$

d. $(x^2+25)^{3/2} - \sqrt{x^2+25} + C$

e. $\frac{3}{2}(x+25)^{3/2} - 25\sqrt{x+25} + C$

f. None of the above

11 Given the series:

$$A = \sum_{k=1}^{\infty} \frac{1}{k^5+9} \quad \text{and} \quad B = \sum_{k=1}^{\infty} \frac{1}{k^4-k}$$

Select the correct answer(s).

- a. Both series are convergent.
- b. Both series are divergent.
- c. Series A diverges by the Integral Test.
- d. Series B and A converges by the Limit Comparison Test.
- e. Series B diverges by the Integral Test.

12. Determine whether the series is absolutely convergent, conditionally convergent, or divergent.

$$\sum_{n=1}^{\infty} \frac{(-1)^n \arctan n}{n^5}$$

Select the correct answer.

- a. divergent
- b. absolutely convergent
- c. conditionally convergent

13. Find the interval of convergence of the series.

$$\sum_{n=1}^{\infty} \frac{(-1)^n x^n}{n+4}$$

Select the correct answer.

- a. $[-1, 1)$
- b. $[-1, 1]$
- c. $(-1, 1]$
- d. $(-1, 1)$
- e. diverges everywhere

14 Evaluate the indefinite integral as a power series.

$$\int \tan^{-1}(t^2) dt$$

Select the correct answer.

a. $C + \sum_{n=0}^{\infty} \frac{(-1)^n t^{4n+3}}{(2n+1)(4n+3)}$

b. $C + \sum_{n=0}^{\infty} \frac{(-1)^n t^{4n+3}}{(4n+3)}$

c. $C + \sum_{n=0}^{\infty} \frac{(-1)^n t^{4n+2}}{(2n+1)(4n+3)}$

d. $C + \sum_{n=0}^{\infty} \frac{(-1)^n t^{2n+2}}{(2n+1)}$

e. $C + \sum_{n=0}^{\infty} \frac{(-1)^n t^{2n+3}}{(2n+3)}$

15 Find a power series representation for $f(x) = \ln(6 - x)$

a. $-\sum_{n=1}^{\infty} \frac{x^n}{6^n} + \ln(6)$

b. $\sum_{n=1}^{\infty} \frac{x^n}{n6^n} + \frac{1}{6}$

c. $\sum_{n=0}^{\infty} \frac{x^n}{n6^n} - \frac{1}{6}$

d. $-\sum_{n=1}^{\infty} \frac{x^n}{n6^n} + \ln(6)$

16. Find the Taylor polynomial T_3 for the function f at the number $a = 1$.

$$f(x) = \ln x$$

Select the correct answer.

a. $(x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3$

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

c. $(x+1) - \frac{1}{4}(x+1)^2 + \frac{1}{3}(x+1)^3$

d. $(x+1) - \frac{1}{5}(x+1)^2 + \frac{1}{7}(x+1)^3$

e. $(x-1) - \frac{1}{5}(x-1)^2 - \frac{1}{7}(x-1)^3$

17.

Find an equation of the tangent line to the curve $x = 2t^2 + 1$, $y = \frac{1}{3}t^3 - t$, when $t = 3$.

a. $y - \frac{8}{6} = 8(x - 19)$

b. $y - \frac{8}{6} = \frac{2}{3}(x - 19)$

c. $y - \frac{8}{6} = 8(x - 12)$

d. None of the above.

18 Find a polar equation for the curve represented by the given Cartesian equation.

$$x^2 = 9y$$

Select the correct answer.

- a. $r = 9 \tan \theta \sin \theta$
- b. $r = 9 \cos \theta \sin \theta$
- c. $r = 9 \tan \theta \sec \theta$
- d. $r = 9 \tan \theta$
- e. $r = 9 \tan \theta \csc \theta$

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Find the slope of the tangent line to the polar equation $r = 2 - \sin \theta$ when $\theta = \frac{\pi}{2}$.

a. $\frac{\sqrt{2}}{1 + \sqrt{2}}$

b. $\frac{-\sqrt{2}}{2}$

c. -1

d. None of the above.

20 Find the area of the region that is bounded by the given curve and lies in the specified sector.

$$r = \sqrt{\sin \theta}, \quad 0 \leq \theta \leq \pi/3$$

Select the correct answer.

a. $A = 1$

b. $A = \frac{1}{4}$

c. $A = \frac{1}{2}$

d. $A = \frac{3}{4}$

e. $A = \frac{\pi}{4}$

21 Sketch the curve with the given equation.

$$r = \sin 6\theta$$

Select the correct answer.

