11. Find an equation of the a line that is tangent to the graph of f *and* parallel to the given line.

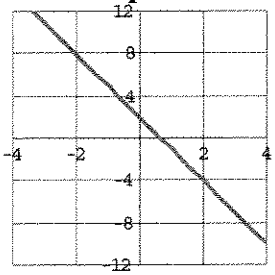
$f(x)=8x^3, \quad 24x-y+10=0$

A) $y=-24x+16$
B) $y=24x-16$
C) $y=-24x-16$
D) $y=24x+16$
E) Both B and D

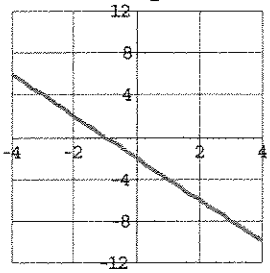
12. Identify the graph which has the following characteristics.

$f(0)=-2$
$f'(x)=2, -\infty<x<\infty$

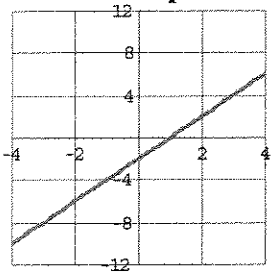
Graph 1



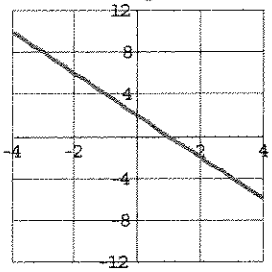
Graph 2



Graph 3



Graph 4



A) Graph 2 B) Graph 1 C) Graph 3 D) Graph 4 E) None of the above

13. Find the derivative of the function.

$f(x)=x^4$

A) $f'(x)=4x^4$
B) $f'(x)=4x^3$
C) $f'(x)=3x^3$
D) $f'(x)=3x^5$
E) None of the above

14. Find the derivative of the function.

$f(x)=\dfrac{1}{x^4}$

A) $f'(x)=-\dfrac{3}{x^5}$
B) $f'(x)=-\dfrac{4}{x^3}$
C) $f'(x)=-\dfrac{4}{x^5}$
D) $f'(x)=-\dfrac{5}{x^5}$
E) None of the above

15. Find the derivative of the function.

$f(x) = 6x^3 + 5x^2 - 3$

A) $f'(x) = 18x^2 + 10x$
B) $f'(x) = 12x^2 + 5x$
C) $f'(x) = 12x + 5x^2$
D) $f'(x) = 18x^2 + 10x - 3$
E) None of the above

16. Find the derivative of the function.

$f(x) = -8x^2 - 4\cos(x)$

A) $f'(x) = -8x + 4\sin(x)$
B) $f'(x) = -16x - 4\sin(x)$
C) $f'(x) = -16x + 4\sin(x)$
D) $f'(x) = -16x - 4\cos(x)$
E) None of the above

17. Find the derivative of the function.

$f(x) = -3x^3 + 2\sin(x)$

A) $f'(x) = -3x^2 - 2\cos(x)$
B) $f'(x) = -9x^2 - 2\cos(x)$
C) $f'(x) = -9x^2 + 2\cos(x)$
D) $f'(x) = -6x^2 + 2\cos(x)$
E) None of the above

18. Find the slope of the graph of the function at the given value.

$f(x) = \dfrac{-2}{x^4}$ when $x = 3$

A) $f'(3) = -\dfrac{8}{243}$
B) $f'(3) = \dfrac{8}{27}$
C) $f'(3) = \dfrac{8}{243}$
D) $f'(3) = -\dfrac{8}{27}$
E) $f'(3) = -\dfrac{2}{81}$

19. Find the slope of the graph of the function at the given value.

$f(x) = 4x^3 - 6x^2$ when $x = 4$

A) $f'(4) = 384$
B) $f'(4) = 144$
C) $f'(4) = 720$
D) $f'(4) = 240$
E) $f'(4) = 40$

20. Find the slope of the graph of the function at the given value.

$f(x)=(5x-6)^2$ when $x=5$

A) $f'(5)=38$
B) $f'(5)=190$
C) $f'(5)=13718$
D) $f'(5)=95$
E) $f'(5)=310$

21. Find the slope of the graph of the function at the given value.

$f(x)=3(5x+5)^2$ when $x=4$

A) $f'(4)=50$
B) $f'(4)=150$
C) $f'(4)=750$
D) $f'(4)=250$
E) $f'(4)=450$

22. Find the slope of the graph of the function at the given value.

$f(x)=-4x^2+\frac{7}{x^2}$ when $x=3$

A) $f'(3)=\frac{634}{27}$
B) $f'(3)=\frac{662}{27}$
C) $f'(3)=-\frac{634}{27}$
D) $f'(3)=-\frac{662}{27}$
E) $f'(3)=-\frac{331}{27}$

23. Find the slope of the graph of the function at the given value.

$f(x)=5x^2+9x-\frac{7}{x^2}$ when $x=-4$

A) $f'(-4)=-\frac{999}{32}$
B) $f'(-4)=\frac{999}{32}$
C) $f'(-4)=-\frac{999}{8}$
D) $f'(-4)=\frac{999}{8}$
E) $f'(-4)=-\frac{999}{2}$

24. Find the slope of the graph of the function at the given value.

$f(x) = x(5x^5 + 9)$ when $x = 4$

A) $f'(4) = 6409$
B) $f'(4) = 30720$
C) $f'(4) = 30729$
D) $f'(4) = 25609$
E) $f'(4) = 30756$

25. Find the slope of the graph of the function at the given value.

$P(z) = z^{\frac{4}{7}} - z^{\frac{3}{4}}$ when $z = 2$

A) $P'(2) = \dfrac{4}{7(2)^{\frac{3}{7}}} + \dfrac{3}{4(2)^{\frac{1}{4}}}$

B) $P'(2) = \dfrac{4}{7(2)^{-\frac{3}{7}}} - \dfrac{3}{4(2)^{-\frac{1}{4}}}$

C) $P'(2) = \dfrac{4}{7(2)^{-\frac{3}{7}}} + \dfrac{3}{4(2)^{-\frac{1}{4}}}$

D) $P'(2) = \dfrac{-4}{7(2)^{\frac{3}{7}}} + \dfrac{3}{4(2)^{\frac{1}{4}}}$

E) $P'(2) = \dfrac{4}{7(2)^{\frac{3}{7}}} - \dfrac{3}{4(2)^{\frac{1}{4}}}$

26. Determine the point(s), (if any), at which the graph of the function has a horizontal tangent.

$y(x) = x^3 + 12x^2 + 3$

A) 0
B) 0 and –8
C) 0 and 8
D) –8
E) There are no points at which the graph has a horizontal tangent.

27. Determine the point(s), (if any), at which the graph of the function has a horizontal tangent.

$y(x) = x^4 - 32x + 3$

A) 0
B) 0 and 2
C) 0 and –2
D) 2
E) There are no points at which the graph has a horizontal tangent.

28. Determine the point(s), (if any), at which the graph of the function has a horizontal tangent.

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

A) 8
B) 8 and 6
C) 8 and –6
D) 6
E) There are no points at which the graph has a horizontal tangent.

29. Determine the point(s), (if any), at which the graph of the function has a horizontal tangent.

$$y(x)=\frac{2x}{(x-7)^2}$$

A) –7
B) 7 and –2
C) –7 and 2
D) 2
E) There are no points at which the graph has a horizontal tangent.

30. A ball is thrown straight down from the top of a 280-ft building with an initial velocity of –12 ft per second.

What is its velocity after 3 seconds?

What is its velocity after falling 130 ft?

The position function is $s(t)=-16t^2+v_0t+s_0$.

A) Its velocity after 3 seconds is –84 ft per second. After falling 130 ft its velocity is about 92.00 ft per second.
B) Its velocity after 3 seconds is –108 ft per second. After falling 130 ft its velocity is about 92.00 ft per second.
C) Its velocity after 3 seconds is –108 ft per second. After falling 130 ft its velocity is about –92.00 ft per second.
D) Its velocity after 3 seconds is –84 ft per second. After falling 130 ft its velocity is about –92.00 ft per second.
E) None of the above

31. A projectile is shot upwards from the surface of the earth with an initial velocity of 120 meters per second.

What is its velocity after 6 seconds?

What is its velocity after 9 seconds?

The position function is $s(t) = -4.9t^2 + v_0 t + s_0$.

A) Its velocity after 6 seconds is –312 meters per second. After 9 seconds its velocity is 31.8 meters per second.
B) Its velocity after 6 seconds is –312 meters per second. After 9 seconds its velocity is –408 meters per second.
C) Its velocity after 6 seconds is 61.2 meters per second. After 9 seconds its velocity is –408 meters per second.
D) Its velocity after 6 seconds is 61.2 meters per second. After 9 seconds its velocity is 31.8 meters per second.
E) None of the above.

32. Use the product rule to differentiate.

$f(r) = \sqrt{r}\left(6 - r^7\right)$

A) $f'(r) = -7r^{7.5} - \dfrac{6 - r^7}{2\sqrt{r}}$

B) $f'(r) = -7r^{7.5} + \dfrac{6 - r^7}{2\sqrt{r}}$

C) $f'(r) = -7r^{6.5} - \dfrac{6 - r^7}{2\sqrt{r}}$

D) $f'(r) = -7r^{6.5} + \dfrac{6 - r^7}{2\sqrt{r}}$

E) None of the above

33. Use the product rule to differentiate.

$R(s) = s^3 \cos s$

A) $R'(s) = -s^3 \cos s + 3s^2 \sin s$
B) $R'(s) = -s^3 \sin s - 3s^2 \cos s$
C) $R'(s) = s^3 \sin s + 3s^2 \cos s$
D) $R'(s) = -s^3 \sin s + 3s^2 \cos s$
E) Both A and B

34. Use the product rule to differentiate.

$P(v) = v^{-4} \sin v$

A) $P'(v) = -v^{-4} \cos v - 4v^{-3} \sin v$
B) $P'(v) = v^{-4} \cos v - 4v^{-5} \sin v$
C) $P'(v) = v^{-4} \cos v + 4v^{-5} \sin v$
D) $P'(v) = v^{-4} \cos v - 4v^3 \sin v$
E) $P'(v) = -v^{-4} \cos v + 4v^{-5} \sin v$

35. Use the product rule to differentiate.

$g(s) = s^{-5} \cos s$

A) $g'(s) = s^{-5} \sin s - 5s^{-6} \cos s$

B) $g'(s) = -s^{-5} \sin s - 5s^{-6} \cos s$

C) $g'(s) = -s^{-5} \sin s + 5s^{-4} \cos s$

D) $g'(s) = 5s^{-4} \cos s - s^{-5} \sin s$

E) $g'(s) = -s^{-5} \sin s + 5s^{-6} \sin s$

36. Use the quotient rule to differentiate.

$g(t) = \dfrac{4t}{t^3 + 5}$

A) $g'(t) = \dfrac{4\left(5 + 2t^3\right)}{\left(t^3 + 5\right)^2}$

B) $g'(t) = -\dfrac{4\left(5 + 4t^3\right)}{\left(t^3 + 5\right)^2}$

C) $g'(t) = -\dfrac{4\left(5 + 3t^3\right)}{\left(t^3 + 5\right)^2}$

D) $g'(t) = -\dfrac{4\left(-5 + 2t^3\right)}{\left(t^3 + 5\right)^2}$

E) $g'(t) = \dfrac{4\left(-5 - 2t^3\right)}{\left(t^3 + 5\right)^2}$

37. Use the quotient rule to differentiate.

$P(s) = \dfrac{9 + s}{s^2 + 4}$

A) $P'(s) = -\dfrac{\left(4 - 18s - s^2\right)}{\left(s^2 + 4\right)^2}$

B) $P'(s) = \dfrac{\left(4 - 18s + s^2\right)}{\left(s^2 + 4\right)^2}$

C) $P'(s) = \dfrac{\left(4 - 9s - s^2\right)}{\left(s^2 + 4\right)^2}$

D) $P'(s) = \dfrac{\left(4 + 18s - s^2\right)}{\left(s^2 + 4\right)^2}$

E) $P'(s) = \dfrac{\left(4 - 18s - s^2\right)}{\left(s^2 + 4\right)^2}$

38. Use the quotient rule to differentiate.

$$f(v)=\frac{\sin v}{v^2+5}$$

A) $f'(v)=\dfrac{\left((5+v^2)\cos v-2v\sin v\right)}{\left(v^2+5\right)}$

B) $f'(v)=\dfrac{\left((5+v^2)\cos v-2v\sin v\right)}{\left(v^2+5\right)^2}$

C) $f'(v)=\dfrac{\left((5+v^2)\cos v+2v\sin v\right)}{\left(v^2+5\right)^2}$

D) $f'(v)=\dfrac{\left((5-v^2)\cos v-2v\sin v\right)}{\left(v^2+5\right)^2}$

E) $f'(v)=\dfrac{\left((5+v)\cos v-2v\sin v\right)}{\left(v^2+5\right)^2}$

39. Use the quotient rule to differentiate the following function and evaluate $H'(2)$.

$$H(v)=\frac{4v}{v^4+3}$$

A) $H'(2)=\dfrac{180}{361}$

B) $H'(2)=-\dfrac{180}{19}$

C) $H'(2)=\dfrac{180}{19}$

D) $H'(2)=-\dfrac{180}{361}$

E) $H'(2)=-\dfrac{180}{6859}$

40. Find the derivative of the algebraic function.

$$P(x)=x\left(2-\frac{4}{x+2}\right)$$

A) $P'(x)=\dfrac{0-8x-2x^2}{(x+2)^2}$

B) $P'(x)=\dfrac{0+8x+2x^2}{(x+2)^2}$

C) $P'(x)=\dfrac{0-8x+2x^2}{(x+2)^2}$

D) $P'(x)=\dfrac{0+8x+2x^2}{(x+2)}$

E) $P'(x)=\dfrac{0+6x+2x^2}{(x+2)^2}$

41. Find the derivative of the algebraic function.

$R(t) = \left(t^5 + 3\right)^4$

A) $R'(t) = 4t^4(t^5+3)^3$
B) $R'(t) = 20t^4(t^5+3)^3$
C) $R'(t) = 20t^6(t^5+3)^3$
D) $R'(t) = 5t^4(t^5+3)^3$
E) $R'(t) = 20t^5(t^5+3)^3$

42. Find the derivative of the algebraic function.

$g(s) = \left(s^5 - 4\right)\left(s^3 + 3\right)$

A) $g'(s) = 8s^7 + 12s^4 - 15s^2$
B) $g'(s) = 8s^7 + 15s^4 + 12s^2$
C) $g'(s) = 8s^7 + 15s^4 - 12s^2$
D) $g'(s) = 8s^7 - 15s^4 - 12s^2$
E) $g'(s) = 8s^7 + 12s^4 + 15s^2$

43. Find the derivative of the trigonometric function.

$H(x) = x^3 \tan x$

A) $H'(x) = x^2 \sec^2 x - 3x^2 \tan x$
B) $H'(x) = x^3 \sec^2 x + 3x^2 \tan x$
C) $H'(x) = 3x^2 \tan x - x^2 \sec^2 x$
D) $H'(x) = x^3 \sec^2 x + 2x^2 \tan x$
E) None of the above

44. Find the derivative of the function.

$g(t) = 36t^6 + 4\sec(t)$

A) $g'(t) = 6t^5 + 4\sec(t)\tan(t)$
B) $g'(t) = 216t^5 + 4\tan(t)$
C) $g'(t) = 216t^5 - 4\sec(t)\ \tan(t)$
D) $g'(t) = 6t^5 + 4\sec^2(t)$
E) $g'(t) = 216t^5 + 4\ \sec(t)\ \tan(t)$

45. Find the derivative of the function.

$f(t) = 5t\sin t + 3\cos t$

A) $f'(t) = -5t\sin t + 2\cos t$
B) $f'(t) = 5t\sin t - 5\cos t$
C) $f'(t) = 5t\sin t - 2\cos t$
D) $f'(t) = 5t\cos t + 2\sin t$
E) $f'(t) = 5t\cos t + 3\sin t$

46. Find the derivative of the function.

$f(s) = 4s^5 \sin s + 3s^8 \cos s$

A) $f'(s) = \left(20s^4 - 3s^8\right)\sin s + \left(4s^5 + 24s^7\right)\cos s$

B) $f'(s) = \left(4s^5 - 24s^7\right)\sin s + \left(20s^4 - 3s^8\right)\cos s$

C) $f'(s) = -\left(20s^4 - 3s^8\right)\sin s + \left(4s^5 + 24s^7\right)\cos s$

D) $f'(s) = \left(20s^8 - 3s^4\right)\sin s + \left(4s^5 + 24s^7\right)\cos s$

E) $f'(s) = \left(20s^4 - 3s^8\right)\sin s - \left(4s^5 + 24s^7\right)\cos s$

47. Find an equation of the tangent line to the graph of f at the given point.

$f(v) = (v-5)(v^2-4)$, at $(3,-10)$

A) $y = 7v + 11$

B) $y = 31v - 7$

C) $y = -7v - 31$

D) $y = -7v + 11$

E) $y = -7 + 11v$

48. The length of a rectangle is $3t + 3$ and its height is t^6, where t is time in seconds and the dimensions are in inches. Find the rate of change of area, A, with respect to time.

A) $\dfrac{dA}{dt} = t^6(18 + 21t)$ square inches/second

B) $\dfrac{dA}{dt} = t^5(18 + 21t)$ square inches/second

C) $\dfrac{dA}{dt} = t^5(18 + 18t)$ inches/second

D) $\dfrac{dA}{dt} = t^5(18 + 21t)$ inches/second

E) $\dfrac{dA}{dt} = t^5(21t + 3)$ square inches/second

49. The radius of a right circular cylinder is $\sqrt{4t+4}$ and its height is t^4, where t is time in seconds and the dimensions are in inches. Find the rate of change of the volume of the cylinder, V, with respect to time.

A) $\frac{dV}{dt} = \pi t^4(16+20t)$ cubic inches/second

B) $\frac{dV}{dt} = \pi t^3(16+20t)$ square inches/second

C) $\frac{dV}{dt} = \pi t^3(16+16t)$ cubic inches/second

D) $\frac{dV}{dt} = \pi t^3(16+20t)$ cubic inches/second

E) $\frac{dV}{dt} = \pi t^3(4+20t)$ inches/second

50. Find the second derivative of the function.

$f(x) = 7x^{\frac{2}{5}}$

A) $f''(x) = \frac{-42}{25}x^{\frac{3}{5}}$

B) $f''(x) = \frac{2}{25}x^{\frac{-8}{5}}$

C) $f''(x) = \frac{175}{25}x^{\frac{-8}{5}}$

D) $f''(x) = \frac{-42}{25}x^{\frac{-8}{5}}$

E) None of the above

51. Find the second derivative of the function.

$R(s) = \frac{6s^2+7s-4}{s}$

A) $R''(s) = \frac{8}{s^3}$

B) $R''(s) = -\frac{8}{s^3}$

C) $R''(s) = \frac{4}{s^3}$

D) $R''(s) = -\frac{8}{s^2}$

E) $R'(s) = -\frac{s+8}{s^3}$