

Can You Get Six in a Row Correct in Six Minutes?

1 Problems

- $\frac{d}{dx} \sqrt{\tan(5x)}$
Solution to Problem 1
- $\frac{d}{dx} (x^3 - x^2)$
Solution to Problem 2
- $\frac{d}{dx} (x^3(x-1))$
Solution to Problem 3
- $\frac{d}{dx} \sqrt{1-x^2}$
Solution to Problem 4
- $\frac{d}{dx} \left[\frac{5}{1-x} \right]$
Solution to Problem 5
- $\frac{d}{dx} \left[\frac{\sin(2x)}{2} \right]$
Solution to Problem 6
- $\frac{d}{dx} \left[\frac{x+1}{x-1} \right]$
Solution to Problem 7
- $\frac{d}{dx} \sec(4x - \sqrt{3})$
Solution to Problem 8
- $\frac{d}{dx} \sec(x)$
Solution to Problem 9
- $\frac{d}{dx} \left[\frac{3}{2+5x} \right]$
Solution to Problem 10
- $\frac{d}{dx} (5x - 2)$
Solution to Problem 11
- $\frac{d}{dx} (x^5(5-x^2))$
Solution to Problem 12
- $\frac{d}{dx} (5x - \tan(3x))$
Solution to Problem 13
- $\frac{d}{dx} \left[\frac{3}{2-5x^2} \right]$
Solution to Problem 14
- $\frac{d}{dx} \left[\frac{\tan(\pi-x)}{\pi} \right]$
Solution to Problem 15
- $\frac{d}{dx} \left[\frac{1-x}{1-3x} \right]$
Solution to Problem 16
- $\frac{d}{dx} \sin(\sqrt{x})$
Solution to Problem 17
- $\frac{d}{dx} (2+x-x^{3/2}+5x^7)$
Solution to Problem 18
- $\frac{d}{dx} (\cos(5x-4) + (2x)^{-5})$
Solution to Problem 19
- $\frac{d}{dx} \left[\frac{x^5 - x^3 - 3x^2}{4x^2} \right]$
Solution to Problem 20
- $\frac{d}{dx} \left[\frac{x^6}{6} \right]$
Solution to Problem 21
- $\frac{d}{dx} ((x-3)(5-x))$
Solution to Problem 22

23. $\frac{d}{dx}(2x - 5\pi)$
Solution to Problem 23

24. $\frac{d}{dx} \sec(3x - x^2)$
Solution to Problem 24

25. $\frac{d}{dx} \left[\frac{7}{1 - x^2} \right]$
Solution to Problem 25

26. $\frac{d}{dx} \sin(1 + \sqrt{x})$
Solution to Problem 26

27. $\frac{d}{dx} \cos(5\sqrt{2x - 3} - 4) + 3x$
Solution to Problem 27

28. $\frac{d}{dx}(x^2 - 3^2)$
Solution to Problem 28

29. $\frac{d}{dx}(x^4(1 - x)^5)$
Solution to Problem 29

30. $\frac{d}{dx} \sqrt{x^2 + x}$
Solution to Problem 30

31. $\frac{d}{dx} \left[\frac{-1}{\tan(3x)} \right]$
Solution to Problem 31

32. $\frac{d}{dx} \left[\frac{\sqrt{1 - x}}{-1} \right]$
Solution to Problem 32

33. $\frac{d}{dx} \left[\frac{x - 3}{x} \right]$
Solution to Problem 33

34. $\frac{d}{dx} \cos^2(5x)$
Solution to Problem 34

35. $\frac{d}{dx} \sqrt{x^3}$
Solution to Problem 35

36. $\frac{d}{dx} \sqrt{x}$
Solution to Problem 36

37. $\frac{d}{dx} \tan(2x^2 + 2x^{-2})$
Solution to Problem 37

38. $\frac{d}{dx}(3x^5 - 4x^7)$
Solution to Problem 38

39. $\frac{d}{dx}((1 - 6x^7)x^9)$
Solution to Problem 39

40. $\frac{d}{dx} \sin(2\pi x)$
Solution to Problem 40

41. $\frac{d}{dx} \left[\frac{2}{\cos(2x)} \right]$
Solution to Problem 41

42. $\frac{d}{dx} \left[\frac{x^5 - x^4 + x^3 - x^2 + x - 1}{5} \right]$
Solution to Problem 42

43. $\frac{d}{dx} \left[\frac{x + 1}{x(x - 1)} \right]$
Solution to Problem 43

44. $\frac{d}{dx} \cos(x^{3/2})$
Solution to Problem 44

45. $\frac{d}{dx} [(x^5 + x^3 + x + 1)(x^2)]$
Solution to Problem 45

46. $\frac{d}{dx} \sqrt{x^2 + \cos^2(x^2)} - 2x$
Solution to Problem 46

47. $\frac{d}{dx} [\cos(2x + 1) - \cos(2x - 1)]$
Solution to Problem 47

48. $\frac{d}{dx} (6(1 - x))$
Solution to Problem 48

49. $\frac{d}{dx}((3-x^5)(1-3^5))$
Solution to Problem 49

50. $\frac{d}{dx} \tan(x/2)$
Solution to Problem 50

51. $\frac{d}{dx} \left[\frac{3^2}{3^2 - x^2} \right]$
Solution to Problem 51

52. $\frac{d}{dx} \left[\frac{\cos(2x) \sin(2x)}{2} \right]$
Solution to Problem 52

53. $\frac{d}{dx} [\cos(5x^4 - x + 1) + \cos(x) - \cos(1)]$
Solution to Problem 53

54. $\frac{d}{dx} [x\sqrt{x^3 - 1} - \cos(3x) + x]$
Solution to Problem 54

55. $\frac{d}{dx} \left[\frac{x^5 - 1}{x - 1} \right]$
Solution to Problem 55

56. $\frac{d}{dx} (2x^{25} - x^{2^{25}})$
Solution to Problem 56

57. $\frac{d}{dx} ((5x + 2)(x^3 + 1)^4)$
Solution to Problem 57

58. $\frac{d}{dx} \sin(3x - 2\pi/3)$
Solution to Problem 58

59. $\frac{d}{dx} \left[\frac{4}{5 - x - x^2} \right]$
Solution to Problem 59

60. $\frac{d}{dx} \left[\frac{\sqrt[4]{x}}{\sqrt[3]{\pi}} \right]$
Solution to Problem 60

61. $\frac{d}{dx} \left[\frac{1+x}{\sqrt{x}} \right]$
Solution to Problem 61

62. $\frac{d}{dx} (x^4 - x \sin(x) - \cos(x - 1))$
Solution to Problem 62

63. $\frac{d}{dx} \cos(x)$
Solution to Problem 63

64. $\frac{d}{dx} [x - (x + \cos(3x))^7 - (2x)^{-5}]$
Solution to Problem 64

65. $\frac{d}{dx} (\cos(x) - \cos(-2x))$
Solution to Problem 65

66. $\frac{d}{dx} ((1-x)^8(1+x)^8)$
Solution to Problem 66

2 Solutions

$$\begin{aligned} 1. \quad & \frac{d}{dx} \sqrt{\tan(5x)} \\ &= \frac{1}{2\sqrt{\tan(5x)}} \frac{d}{dx} \tan(5x) \\ &= \frac{1}{2\sqrt{\tan(5x)}} \sec^2(5x) \frac{d}{dx} (5x) \\ &= \frac{1}{2\sqrt{\tan(5x)}} \sec^2(5x) 5 \\ &= \frac{5 \sec^2(5x)}{2\sqrt{\tan(5x)}} \end{aligned}$$

Problem 1

$$\begin{aligned} 2. \quad & \frac{d}{dx} (x^3 - x^2) \\ &= 3x^2 - 2x \end{aligned}$$

Problem 2

$$\begin{aligned} 3. \quad & \frac{d}{dx}(x^3(x-1)) \\ &= x^3 \frac{d}{dx}(x-1) + (x-1) \frac{d}{dx} x^3 \end{aligned}$$

$$= x^3 + (x-1)3x^2$$

$$= x^3 + 3x^2(x-1)$$

Problem 3

$$\begin{aligned} 4. \quad & \frac{d}{dx} \sqrt{1-x^2} \\ &= \frac{1}{2\sqrt{1-x^2}} \frac{d}{dx} (1-x^2) \end{aligned}$$

$$= \frac{1}{2\sqrt{1-x^2}} (-2x)$$

$$= \frac{-x}{\sqrt{1-x^2}}$$

Problem 4

$$\begin{aligned} 5. \quad & \frac{d}{dx} \left[\frac{5}{1-x} \right] \\ &= 5 \frac{d}{dx} (1-x)^{-1} \end{aligned}$$

$$= 5(-1)(1-x)^{-2} \frac{d}{dx} (1-x)$$

$$= 5(-1)(1-x)^{-2}(-1)$$

$$= \frac{5}{(1-x)^2}$$

Problem 5

$$\begin{aligned} 6. \quad & \frac{d}{dx} \left[\frac{\sin(2x)}{2} \right] \\ &= \frac{1}{2} \frac{d}{dx} \sin(2x) \end{aligned}$$

$$= \frac{1}{2} \cos(2x) \frac{d}{dx} (2x)$$

$$= \frac{1}{2} \cos(2x) 2$$

$$= \cos(2x)$$

Problem 6

$$\begin{aligned}
7. \quad & \frac{d}{dx} \left[\frac{x+1}{x-1} \right] \\
&= \frac{(x-1) \frac{d}{dx}(x+1) - (x+1) \frac{d}{dx}(x-1)}{(x-1)^2} \\
&= \frac{(x-1)(1) - (x+1)(1)}{(x-1)^2} \\
&= \frac{-2}{(x-1)^2}
\end{aligned}$$

Problem 7

$$\begin{aligned}
8. \quad & \frac{d}{dx} \sec(4x - \sqrt{3}) \\
&= \sec(4x - \sqrt{3}) \tan(4x - \sqrt{3}) \frac{d}{dx}(4x - \sqrt{3}) \\
&= \sec(4x - \sqrt{3}) \tan(4x - \sqrt{3})(4) \\
&= 4 \sec(4x - \sqrt{3}) \tan(4x - \sqrt{3})
\end{aligned}$$

Problem 8

$$\begin{aligned} 9. \quad & \frac{d}{dx} \sec(x) \\ &= \sec(x) \tan(x) \end{aligned}$$

Problem 9

$$\begin{aligned} 10. \quad & \frac{d}{dx} \left[\frac{3}{2+5x} \right] \\ &= 3 \frac{d}{dx} (2+5x)^{-1} \\ &= 3(-1)(2+5x)^{-2} \frac{d}{dx} (2+5x) \\ &= 3(-1)(2+5x)^{-2}(5) \\ &= \frac{-15}{(2+5x)^2} \end{aligned}$$

Problem 10

$$11. \quad \frac{d}{dx}(5x - 2) \\ = 5$$

Problem 11

$$12. \quad \frac{d}{dx}(x^5(5 - x^2)) \\ = \frac{d}{dx}(5x^5 - x^7)$$

$$= 5(5)x^4 - 7x^6$$

$$= 25x^4 - 7x^6$$

Problem 12

$$\begin{aligned} 13. \quad & \frac{d}{dx}(5x - \tan(3x)) \\ &= 5 - \sec^2(3x) \frac{d}{dx}(3x) \end{aligned}$$

$$= 5 - 3\sec^2(3x)$$

Problem 13

$$\begin{aligned} 14. \quad & \frac{d}{dx} \left[\frac{3}{2 - 5x^2} \right] \\ &= 3 \frac{d}{dx} (2 - 5x^2)^{-1} \end{aligned}$$

$$= 3(-1)(2 - 5x^2)^{-2} \frac{d}{dx}(2 - 5x^2)$$

$$= 3(-1)(2 - 5x^2)^{-2}(-10x)$$

$$= \frac{30x}{(2 - 5x^2)^2}$$

Problem 14

$$\begin{aligned}
15. \quad & \frac{d}{dx} \left[\frac{\tan(\pi - x)}{\pi} \right] \\
&= \frac{1}{\pi} \frac{d}{dx} \tan(\pi - x) \\
&= \frac{1}{\pi} \sec^2(\pi - x) \frac{d}{dx}(\pi - x) \\
&= \frac{1}{\pi} \sec^2(\pi - x)(-1) \\
&= \frac{-1}{\pi} \sec^2(\pi - x)
\end{aligned}$$

Problem 15

$$\begin{aligned}
16. \quad & \frac{d}{dx} \left[\frac{1-x}{1-3x} \right] \\
&= \frac{(1-3x) \frac{d}{dx}(1-x) - (1-x) \frac{d}{dx}(1-3x)}{(1-3x)^2} \\
&= \frac{(1-3x)(-1) - (1-x)(-3)}{(1-3x)^2} \\
&= \frac{2}{(1-3x)^2}
\end{aligned}$$

Problem 16

$$\begin{aligned} 17. \quad & \frac{d}{dx} \sin(\sqrt{x}) \\ &= \cos(\sqrt{x}) \frac{d}{dx} \sqrt{x} \end{aligned}$$

$$= \cos(\sqrt{x}) \frac{1}{2\sqrt{x}}$$

$$= \frac{\cos(\sqrt{x})}{2\sqrt{x}}$$

Problem 17

$$\begin{aligned} 18. \quad & \frac{d}{dx} [2 + x - x^{3/2} + 5x^7] \\ &= 1 - (3/2)x^{-1/2} + 5 \cdot 7x^6 \end{aligned}$$

Problem 18

$$\begin{aligned}
19. \quad & \frac{d}{dx} [\cos(5x - 4) + (2x)^{-5}] \\
&= -\sin(5x - 4) \frac{d}{dx} (5x - 4) + (-5)(2x)^{-6} \frac{d}{dx} (2x) \\
&= -\sin(5x - 4)(5) + (-5)(2x)^{-6}(2) \\
&= -5 \sin(5x - 4) - 10(2x)^{-6}
\end{aligned}$$

Problem 19

$$\begin{aligned}
20. \quad & \frac{d}{dx} \left[\frac{x^5 - x^3 - 3x^2}{4x^2} \right] \\
&= \frac{1}{4} \frac{d}{dx} (x^3 - x - 3) \\
&= \frac{1}{4} (3x^2 - 1) \\
&= \frac{3x^2 - 1}{4}
\end{aligned}$$

Problem 20

$$\begin{aligned} 21. \quad & \frac{d}{dx} \left[\frac{x^6}{6} \right] \\ &= \frac{1}{6} \frac{d}{dx} x^6 \\ &= \frac{1}{6} 6x^5 \\ &= x^5 \end{aligned}$$

Problem 21

$$\begin{aligned} 22. \quad & \frac{d}{dx} ((x-3)(5-x)) \\ &= (x-3) \frac{d}{dx} (5-x) + (5-x) \frac{d}{dx} (x-3) \\ &= (x-3)(-1) + (5-x)(+1) \\ &= -2x + 8 \end{aligned}$$

Problem 22

$$23. \quad \frac{d}{dx}(2x - 5\pi)$$

$$= 2 + 0$$

$$= 2$$

Problem 23

$$24. \quad \frac{d}{dx} \sec(3x - x^2)$$

$$= \sec(3x - x^2) \tan(3x - x^2) \frac{d}{dx}(3x - x^2)$$

$$= \sec(3x - x^2) \tan(3x - x^2)(3 - 2x)$$

$$= (3 - 2x) \sec(3x - x^2) \tan(3x - x^2)$$

Problem 24

$$\begin{aligned}
25. \quad & \frac{d}{dx} \left[\frac{7}{1-x^2} \right] \\
&= 7 \frac{d}{dx} (1-x^2)^{-1} \\
&= 7(-1)(1-x^2)^{-2} \frac{d}{dx} (1-x^2) \\
&= 7(-1)(1-x^2)^{-2} (-2x) \\
&= \frac{14x}{(1-x^2)^2}
\end{aligned}$$

Problem 25

$$\begin{aligned}
26. \quad & \frac{d}{dx} \sin(1 + \sqrt{x}) \\
&= \cos(1 + \sqrt{x}) \frac{d}{dx} (1 + \sqrt{x}) \\
&= \cos(1 + \sqrt{x}) \frac{1}{2\sqrt{x}} \\
&= \frac{\cos(1 + \sqrt{x})}{2\sqrt{x}}
\end{aligned}$$

Problem 26

$$\begin{aligned}
27. \quad & \frac{d}{dx} \cos(5\sqrt{2x-3}-4) + 3x \\
&= -\sin(5\sqrt{2x-3}-4) \frac{d}{dx}(5\sqrt{2x-3}-4) + 3 \\
&= -\sin(5\sqrt{2x-3}-4) \left[5 \frac{1}{2\sqrt{2x-3}} \frac{d}{dx}(2x-3) \right] + 3 \\
&= -\sin(5\sqrt{2x-3}-4) \left[5 \frac{1}{2\sqrt{2x-3}} (2) \right] + 3 \\
&= \frac{-5 \sin(5\sqrt{2x-3}-4)}{\sqrt{2x-3}} + 3
\end{aligned}$$

Problem 27

$$\begin{aligned}
28. \quad & \frac{d}{dx}(x^2-3^2) \\
&= 2x + 0 \\
&= 2x
\end{aligned}$$

Problem 28

$$29. \quad \frac{d}{dx}(x^4(1-x)^5)$$

$$= x^4 \frac{d}{dx}(1-x)^5 + (1-x)^5 \frac{d}{dx}x^4$$

$$= x^4(5)(1-x)^4 \frac{d}{dx}(1-x) + (1-x)^5(4x^3)$$

$$= x^4(5)(1-x)^4(-1) + (1-x)^5(4x^3)$$

$$= -5x^4(1-x)^4 + 4x^3(1-x)^5$$

Problem 29

$$30. \quad \frac{d}{dx} \sqrt{x^2 + x}$$

$$= \frac{1}{2\sqrt{x^2 + x}} \frac{d}{dx}(x^2 + x)$$

$$= \frac{1}{2\sqrt{x^2 + x}}(2x + 1)$$

$$= \frac{2x + 1}{2\sqrt{x^2 + x}}$$

Problem 30

$$\begin{aligned}
31. \quad & \frac{d}{dx} \left[\frac{-1}{\tan(3x)} \right] \\
&= -\frac{d}{dx} (\tan(3x))^{-1} \\
&= -(-1)(\tan(3x))^{-2} \frac{d}{dx} \tan(3x) \\
&= -(-1)(\tan(3x))^{-2} \sec^2(3x) \frac{d}{dx} (3x) \\
&= -(-1)(\tan(3x))^{-2} \sec^2(3x)(3) \\
&= \frac{3 \sec^2(3x)}{\tan^2(3x)}
\end{aligned}$$

Problem 31

$$\begin{aligned}
32. \quad & \frac{d}{dx} \left[\frac{\sqrt{1-x}}{-1} \right] \\
&= -\frac{d}{dx} \sqrt{1-x} \\
&= -\frac{1}{2\sqrt{1-x}} \frac{d}{dx} (1-x) \\
&= -\frac{1}{2\sqrt{1-x}} (-1) \\
&= \frac{1}{2\sqrt{1-x}}
\end{aligned}$$

Problem 32

$$\begin{aligned} 33. \quad & \frac{d}{dx} \left[\frac{x-3}{x} \right] \\ &= \frac{d}{dx} (1 - 3x^{-1}) \\ &= -3(-1)x^{-2} \\ &= \frac{3}{x^2} \end{aligned}$$

Problem 33

$$\begin{aligned} 34. \quad & \frac{d}{dx} \cos^2(5x) \\ &= 2 \cos(5x) \frac{d}{dx} \cos(5x) \\ &= 2 \cos(5x) (-\sin(5x)) \frac{d}{dx} (5x) \\ &= 2 \cos(5x) (-\sin(5x)) (5) \\ &= -10 \cos(5x) \sin(5x) \end{aligned}$$

Problem 34

$$\begin{aligned} 35. \quad & \frac{d}{dx} \sqrt{x^3} \\ &= \frac{d}{dx} x^{3/2} \end{aligned}$$

$$= \frac{3}{2} x^{1/2}$$

Problem 35

$$\begin{aligned} 36. \quad & \frac{d}{dx} \sqrt{x} \\ &= \frac{1}{2\sqrt{x}} \end{aligned}$$

Problem 36

$$\begin{aligned} 37. \quad & \frac{d}{dx} \tan(2x^2 + 2x^{-2}) \\ &= \sec^2(2x^2 + 2x^{-2}) \frac{d}{dx} (2x^2 + 2x^{-2}) \\ &= \sec^2(2x^2 + 2x^{-2}) (4x + 2(-2)x^{-3}) \\ &= (4x - 4x^{-3}) \sec^2(2x^2 + 2x^{-2}) \end{aligned}$$

Problem 37

$$\begin{aligned} 38. \quad & \frac{d}{dx} (3x^5 - 4x^7) \\ &= 3 \cdot 5x^4 - 4 \cdot 7x^6 \\ &= 15x^4 - 28x^6 \end{aligned}$$

Problem 38

$$\begin{aligned} 39. \quad & \frac{d}{dx}((1 - 6x^7)x^9) \\ &= \frac{d}{dx}(x^9 - 6x^{16}) \\ &= 9x^8 - 6 \cdot 16x^{15} \end{aligned}$$

Problem 39

$$\begin{aligned} 40. \quad & \frac{d}{dx} \sin(2\pi x) \\ &= \cos(2\pi x) \frac{d}{dx}(2\pi x) \\ &= \cos(2\pi x)(2\pi) \\ &= 2\pi \cos(2\pi x) \end{aligned}$$

Problem 40

$$41. \quad \frac{d}{dx} \left[\frac{2}{\cos(2x)} \right]$$

$$= 2 \frac{d}{dx} (\cos(2x))^{-1}$$

$$= 2(-1)(\cos(2x))^{-2} \frac{d}{dx} (\cos(2x))$$

$$= 2(-1)(\cos(2x))^{-2} (-\sin(2x)) \frac{d}{dx} (2x)$$

$$= 2(-1)(\cos(2x))^{-2} (-\sin(2x))(2)$$

$$= \frac{-4 \sin(2x)}{\cos^2(2x)}$$

Problem 41

$$42. \quad \frac{d}{dx} \left[\frac{x^5 - x^4 + x^3 - x^2 + x - 1}{5} \right]$$

$$= \frac{1}{5} \frac{d}{dx} (x^5 - x^4 + x^3 - x^2 + x - 1)$$

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

Problem 42

$$43. \quad \frac{d}{dx} \left[\frac{x+1}{x(x-1)} \right]$$

$$= \frac{d}{dx} \left[\frac{x+1}{x^2-x} \right]$$

$$= \left[\frac{(x^2-x) \frac{d}{dx}(x+1) - (x+1) \frac{d}{dx}(x^2-x)}{(x^2-x)^2} \right]$$

$$= \left[\frac{(x^2-x) - (x+1)(2x-1)}{(x^2-x)^2} \right]$$

Problem 43

$$44. \quad \frac{d}{dx} \cos(x^{3/2})$$

$$= -\sin(x^{3/2}) \frac{d}{dx} x^{3/2}$$

$$= -\sin(x^{3/2}) \frac{3}{2} x^{1/2}$$

$$= \frac{-3x^{1/2}}{2} \sin(x^{3/2})$$

Problem 44

$$\begin{aligned}
45. \quad & \frac{d}{dx}[(x^5 + x^3 + x + 1)(x^2)] \\
&= \frac{d}{dx}(x^7 + x^5 + x^3 + x^2) \\
&= 7x^6 + 5x^4 + 3x^2 + 2x
\end{aligned}$$

Problem 45

$$\begin{aligned}
46. \quad & \frac{d}{dx} \sqrt{x^2 + \cos^2(x^2)} - 2x \\
&= \frac{1}{2\sqrt{x^2 + \cos^2(x^2)}} \frac{d}{dx} [x^2 + \cos^2(x^2)] - 2 \\
&= \frac{1}{2\sqrt{x^2 + \cos^2(x^2)}} [2x + 2 \cos(x^2) \frac{d}{dx} \cos(x^2)] - 2 \\
&= \frac{1}{2\sqrt{x^2 + \cos^2(x^2)}} [2x - 2 \cos(x^2) \sin(x^2) \frac{d}{dx} (x^2)] - 2 \\
&= \frac{1}{2\sqrt{x^2 + \cos^2(x^2)}} [2x - 2 \cos(x^2) \sin(x^2) (2x)] - 2 \\
&= \frac{x - 2x \cos(x^2) \sin(x^2)}{\sqrt{x^2 + \cos^2(x^2)}} - 2
\end{aligned}$$

Problem 46

$$\begin{aligned} 47. \quad & \frac{d}{dx} [\cos(2x + 1) - \cos(2x - 1)] \\ &= -\sin(2x + 1) \frac{d}{dx}(2x + 1) + \sin(2x - 1) \frac{d}{dx}(2x - 1) \\ &= -\sin(2x + 1)(2) + \sin(2x - 1)(2) \\ &= -2\sin(2x + 1) + 2\sin(2x - 1) \end{aligned}$$

Problem 47

$$\begin{aligned} 48. \quad & \frac{d}{dx} (6(1 - x)) \\ &= 6 \frac{d}{dx} (1 - x) \\ &= -6 \end{aligned}$$

Problem 48

$$\begin{aligned} 49. \quad & \frac{d}{dx}((3-x^5)(1-3^5)) \\ &= (1-3^5) \frac{d}{dx}(3-x^5) \\ &= (1-3^5)5x^4 \\ &= 5(1-3^5)x^4 \end{aligned}$$

Problem 49

$$\begin{aligned} 50. \quad & \frac{d}{dx} \tan(x/2) \\ &= \sec^2(x/2) \frac{d}{dx}(x/2) \\ &= \sec^2(x/2)(1/2) \\ &= \frac{1}{2} \sec^2(x/2) \end{aligned}$$

Problem 50

$$\begin{aligned}
51. \quad & \frac{d}{dx} \left[\frac{3^2}{3^2 - x^2} \right] \\
&= 3^2 \frac{d}{dx} (3^2 - x^2)^{-1} \\
&= 3^2 (-1) (3^2 - x^2)^{-2} \frac{d}{dx} (3^2 - x^2) \\
&= 3^2 (-1) (3^2 - x^2)^{-2} (0 - 2x) \\
&= \frac{3^2 2x}{(3^2 - x^2)^2}
\end{aligned}$$

Problem 51

$$\begin{aligned}
52. \quad & \frac{d}{dx} \left[\frac{\cos(2x) \sin(2x)}{2} \right] \\
&= \frac{1}{2} \frac{d}{dx} [\cos(2x) \sin(2x)] \\
&= \frac{1}{2} \left[\cos(2x) \frac{d}{dx} \sin(2x) + \sin(2x) \frac{d}{dx} \cos(2x) \right] \\
&= \frac{1}{2} \left[\cos(2x) \cos(2x) \frac{d}{dx} (2x) - \sin(2x) \sin(2x) \frac{d}{dx} (2x) \right] \\
&= \frac{1}{2} [\cos(2x) \cos(2x)(2) - \sin(2x) \sin(2x)(2)] \\
&= \cos^2(2x) - \sin^2(2x)
\end{aligned}$$

Problem 52

$$\begin{aligned}
53. \quad & \frac{d}{dx} [\cos(5x^4 - x + 1) + \cos(x) - \cos(1)] \\
&= -\sin(5x^4 - x + 1) \frac{d}{dx} (5x^4 - x + 1) - \sin(x) - 0 \\
&= -\sin(5x^4 - x + 1)(5 \cdot 4x^3 - 1) - \sin(x) \\
&= (1 - 20x^3) \sin(5x^4 - x + 1) - \sin(x)
\end{aligned}$$

Problem 53

$$\begin{aligned}
54. \quad & \frac{d}{dx} [x\sqrt{x^3 - 1} - \cos(3x) + x] \\
&= [x \frac{d}{dx} \sqrt{x^3 - 1} + \sqrt{x^3 - 1}] + \sin(3x) \frac{d}{dx} (3x) + 1 \\
&= x \frac{1}{2\sqrt{x^3 - 1}} \frac{d}{dx} (x^3 - 1) + \sqrt{x^3 - 1} + 3 \sin(3x) + 1 \\
&= x \frac{1}{2\sqrt{x^3 - 1}} (3x^2) + \sqrt{x^3 - 1} + 3 \sin(3x) + 1 \\
&= \frac{3x^3}{2\sqrt{x^3 - 1}} + \sqrt{x^3 - 1} + 3 \sin(3x) + 1
\end{aligned}$$

Problem 54

$$\begin{aligned}
 55. \quad & \frac{d}{dx} \left[\frac{x^5 - 1}{x - 1} \right] \\
 &= \frac{(x - 1) \frac{d}{dx} (x^5 - 1) - (x^5 - 1) \frac{d}{dx} (x - 1)}{(x - 1)^2} \\
 &= \frac{(x - 1)(5x^4) - (x^5 - 1)}{(x - 1)^2}
 \end{aligned}$$

Problem 55

$$\begin{aligned}
 56. \quad & \frac{d}{dx} (2x^{25} - x2^{25}) \\
 &= 2 \cdot 25x^{24} - 2^{25} \\
 &= 50x^{24} - 2^{25}
 \end{aligned}$$

Problem 56

$$\begin{aligned}
57. \quad & \frac{d}{dx}((5x+2)(x^3+1)^4) \\
&= (5x+2)\frac{d}{dx}(x^3+1)^4 + (x^3+1)^4\frac{d}{dx}(5x+2) \\
&= (5x+2)4(x^3+1)^3\frac{d}{dx}(x^3+1) + (x^3+1)^4(5) \\
&= (5x+2)4(x^3+1)^3(3x^2) + (x^3+1)^4(5) \\
&= (12x^2)(5x+2)(x^3+1)^3 + 5(x^3+1)^4
\end{aligned}$$

Problem 57

$$\begin{aligned}
58. \quad & \frac{d}{dx}\sin(3x-2\pi/3) \\
&= \cos(3x-2\pi/3)\frac{d}{dx}(3x-2\pi/3) \\
&= \cos(3x-2\pi/3)(3+0) \\
&= 3\cos(3x-2\pi/3)
\end{aligned}$$

Problem 58

$$59. \quad \frac{d}{dx} \left[\frac{4}{5-x-x^2} \right]$$

$$= 4 \frac{d}{dx} (5-x-x^2)^{-1}$$

$$= 4(-1)(5-x-x^2)^{-2} \frac{d}{dx} (5-x-x^2)$$

$$= 4(-1)(5-x-x^2)^{-2}(-1-2x)$$

$$= \frac{4+8x}{(5-x-x^2)^{-2}}$$

Problem 59

$$60. \quad \frac{d}{dx} \left[\frac{\sqrt[4]{x}}{\sqrt[3]{\pi}} \right]$$

$$= \frac{1}{\sqrt[3]{\pi}} \frac{d}{dx} \sqrt[4]{x}$$

$$= \frac{1}{\sqrt[3]{\pi}} \frac{d}{dx} x^{1/4}$$

$$= \frac{1}{\sqrt[3]{\pi}} \frac{1}{4} x^{-3/4}$$

$$= \frac{1}{4 \sqrt[3]{\pi} \sqrt[4]{x^3}}$$

Problem 60

$$\begin{aligned}
61. \quad & \frac{d}{dx} \left[\frac{1+x}{\sqrt{x}} \right] \\
&= \frac{d}{dx} [x^{1/2} + x^{-1/2}] \\
&= \frac{1}{2}x^{-1/2} + \frac{-1}{2}x^{-3/2} \\
&= \frac{x^{-1/2} - x^{-3/2}}{2}
\end{aligned}$$

Problem 61

$$\begin{aligned}
62. \quad & \frac{d}{dx} (x^4 - x \sin(x) - \cos(x-1)) \\
&= 4x^3 - \left[x \frac{d}{dx} \sin(x) + \sin(x) \frac{d}{dx} x \right] + \sin(x-1) \frac{d}{dx} (x-1) \\
&= 4x^3 - [x \cos(x) + \sin(x)] + \sin(x-1) \\
&= 4x^3 - x \cos(x) - \sin(x) + \sin(x-1)
\end{aligned}$$

Problem 62

$$\begin{aligned}
 63. \quad & \frac{d}{dx} \cos(x) \\
 & = -\sin(x)
 \end{aligned}$$

Problem 63

$$\begin{aligned}
 64. \quad & \frac{d}{dx} [x - (x + \cos(3x))^7 - (2x)^{-5}] \\
 & = 1 - 7(x + \cos(3x))^6 \frac{d}{dx} (x + \cos(3x)) - (-5)(2x)^{-6} \frac{d}{dx} (2x) \\
 & = 1 - 7(x + \cos(3x))^6 (1 - \sin(3x) \frac{d}{dx} (3x)) - (-5)(2x)^{-6} (2) \\
 & = 1 - 7(x + \cos(3x))^6 (1 - 3 \sin(3x)) - (-5)(2x)^{-6} (2) \\
 & = 1 - 7(x + \cos(3x))^6 (1 - 3 \sin(3x)) + 10(2x)^{-6}
 \end{aligned}$$

Problem 64

$$\begin{aligned}
65. \quad & \frac{d}{dx}(\cos(x) - \cos(-2x)) \\
&= -\sin(x) + \sin(-2x) \frac{d}{dx}(-2x) \\
&= -\sin(x) + \sin(-2x)(-2) \\
&= -\sin(x) - 2\sin(-2x)
\end{aligned}$$

Problem 65

$$\begin{aligned}
66. \quad & \frac{d}{dx}((1-x)^8(1+x)^8) \\
&= (1-x)^8 \frac{d}{dx}(1+x)^8 + (1+x)^8 \frac{d}{dx}(1-x)^8 \\
&= (1-x)^8 8(1+x)^7 \frac{d}{dx}(1+x) + (1+x)^8 8(1-x)^7 \frac{d}{dx}(1-x) \\
&= (1-x)^8 8(1+x)^7 + (1+x)^8 8(1-x)^7(-1) \\
&= 8(1-x)^8(1+x)^7 - 8(1+x)^8(1-x)^7
\end{aligned}$$

Problem 66