

$$3. y = 8$$

$$y' = 0$$

$$5. y = x^6$$

$$y' = 6x^5$$

$$7. y = \frac{1}{x^7} = x^{-7}$$

$$y' = -7x^{-8} = \frac{-7}{x^8}$$

$$9. y = \sqrt[3]{x} = x^{1/3}$$

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

$$11. f(x) = x + 1$$

$$f'(x) = 1$$

$$13. f(t) = -2t^2 + 3t - 6$$

$$f'(t) = -4t + 3$$

$$15. g(x) = x^2 + 4x^3$$

$$g'(x) = 2x + 12x^2$$

$$17. s(t) = t^3 - 2t + 4$$

$$s'(t) = 3t^2 - 2$$

$$31. f(x) = \frac{3}{x^2} = 3x^{-2}, (1, 3)$$

$$f'(x) = -6x^{-3} = \frac{-6}{x^3}$$

$$f'(1) = -6$$

$$33. f(x) = -\frac{1}{2} + \frac{7}{5}x^3, \left(0, -\frac{1}{2}\right)$$

$$f'(x) = \frac{21}{5}x^2$$

$$f'(0) = 0$$

$$35. y = (2x + 1)^2, (0, 1)$$

$$= 4x^2 + 4x + 1$$

$$y' = 8x + 4$$

$$y'(0) = 4$$

$$37. f(\theta) = 4 \sin \theta - \theta, (0, 0)$$

$$f'(\theta) = 4 \cos \theta - 1$$

$$f'(0) = 4(1) - 1 = 3$$

$$39. f(x) = x^2 + 5 - 3x^{-2}$$

$$f'(x) = 2x + 6x^{-3} = 2x + \frac{6}{x^3}$$

$$41. g(t) = t^2 - \frac{4}{t^3} = t^2 - 4t^{-3}$$

$$g'(t) = 2t + 12t^{-4} = 2t + \frac{12}{t^4}$$

$$43. f(x) = \frac{x^3 - 3x^2 + 4}{x^2} = x - 3 + 4x^{-2}$$

$$f'(x) = 1 - \frac{8}{x^3} = \frac{x^3 - 8}{x^3}$$

$$45. y = x(x^2 + 1) = x^3 + x$$

$$y' = 3x^2 + 1$$

$$47. f(x) = \sqrt{x} - 6\sqrt[3]{x} = x^{1/2} - 6x^{1/3}$$

$$f'(x) = \frac{1}{2}x^{-1/2} + 2x^{-2/3} = \frac{1}{2\sqrt{x}} + \frac{2}{x^{2/3}}$$

$$49. h(s) = s^{4/5} - s^{2/3}$$

$$h'(s) = \frac{4}{5}s^{-1/5} - \frac{2}{3}s^{-1/3} = \frac{4}{5s^{1/5}} - \frac{2}{3s^{1/3}}$$

$$51. f(x) = 6\sqrt{x} + 5 \cos x = 6x^{1/2} + 5 \cos x$$

$$f'(x) = 3x^{-1/2} - 5 \sin x = \frac{3}{\sqrt{x}} - 5 \sin x$$

$$53. (a) y = x^4 - 3x^2 + 2$$

$$y' = 4x^3 - 6x$$

$$\text{At } (1, 0): y' = 4(1)^3 - 6(1) = -2.$$

$$\text{Tangent line: } y - 0 = -2(x - 1)$$

$$2x + y - 2 = 0$$

$$55. (a) f(x) = \frac{2}{\sqrt[3]{x^3}} = 2x^{-3/4}$$

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

$$\text{At } (1, 2), f'(1) = \frac{-3}{2}$$

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$$(19) \quad y' = \frac{\pi}{2} \cos \theta + \sin \theta$$

$$(20) \quad y' = -\pi + \sin t$$

$$(21) \quad y' = 2x + \frac{1}{2} \sin x$$

$$(22) \quad y' = \cos x$$

$$(23) \quad y' = \frac{1}{x^2} - 3 \cos x$$

$$(24) \quad y' = \frac{-15}{8x^4} - 2 \sin x$$

$$(51) \quad y' = \frac{3}{\sqrt{x}} - 5 \sin x$$

$$(61) \quad y' = 1 + \cos x$$
$$1 + \cos x = 0$$
$$\cos x = -1$$

$$x = \pi$$

$$y = \pi$$

plug into $f(x)$

$$(\pi, \pi)$$