

3.1

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$$2) f(x) = \sqrt{30} \quad \frac{df}{dx} = [0] = \underline{\underline{0}}$$

$$4) w(r) = r^{50} \quad \frac{dw}{dr} = [50 r^{49}] = \underline{\underline{50 r^{49}}}$$

$$6) h(v) = v^{-3} \quad \frac{dh}{dv} = [-3 v^{-4}] = -3 v^{-4} = \underline{\underline{\frac{-3}{v^4}}}$$

$$8) y = x^{-\frac{1}{3}} \quad \frac{dy}{dx} = \left[ -\frac{1}{3} x^{-\frac{4}{3}} \right] = -\frac{1}{3} x^{-\frac{4}{3}} = \underline{\underline{\frac{-1}{3(\sqrt[3]{x})^4}}}}$$

$$10) R(a) = \frac{1}{a^4} = a^{-4} \quad \frac{dR}{da} = [-4 a^{-5}] = \underline{\underline{\frac{-4}{a^5}}}$$

$$12) y = 2.1x^5 \quad \frac{dy}{dx} = 2.1 [5x^4] = \underline{\underline{10.5x^4}}$$

$$14) R(t) = 5t^{-\frac{3}{5}} \quad \frac{dR}{dt} = 5 \left[ -\frac{3}{5} t^{-\frac{8}{5}} \right] = \underline{\underline{\frac{-3}{(\sqrt[5]{t})^8}}}}$$

$$16) y = \frac{1}{2}x + \frac{7}{2} \quad \frac{dy}{dx} = \frac{1}{2}[1] + [0] = \underline{\underline{\frac{1}{2}}}$$

$$18) f(t) = \frac{1}{2}t^6 - 3t^4 + t \quad \frac{df}{dt} = \frac{1}{2}[6t^5] - 3[4t^3] + [1] \\ = \underline{\underline{3t^5 - 12t^3 + 1}}$$

$$20) P = -3.5x^3 + 4.9x^2 + 4.1x - 8.5$$

$$\frac{dP}{dx} = -3.5[3x^2] + 4.9[2x] + 4.1[1] - [0] \\ = \underline{\underline{-10.5x^2 + 9.8x + 4.1}}$$

$$22) h(t) = 8t^2 + 2t - e^t$$

$$\frac{dh}{dt} = 8[2t] + 2[1] - [e^t(1)] = \underline{\underline{16t + 2 - e^t}}$$

$$24) y = 5e^t + 3$$

$$\frac{dy}{dt} = 5[e^t(1)] + [0] = \underline{\underline{5e^t}}$$

$$26) h(x) = (x-2)(2x+3) = 2x^2 + 3x - 4x - 6 = 2x^2 - x - 6$$

$$\frac{dh}{dx} = 2[2x] - [1] - [0] = \underline{\underline{4x - 1}}$$

$$28) A(t) = \frac{2}{\sqrt{t}} + \frac{3}{t^{\frac{2}{3}}} = 2t^{-\frac{1}{2}} + 3t^{-\frac{2}{3}}$$

$$\frac{dA}{dt} = 2\left[-\frac{1}{2}t^{-\frac{3}{2}}\right] + 3\left[-\frac{2}{3}t^{-\frac{5}{3}}\right] = \underline{\underline{\frac{-1}{(\sqrt{t})^3} - \frac{2}{(\sqrt[3]{t})^5}}}}$$

$$30) y = \sqrt{x}(x-1) = x\sqrt{x} - \sqrt{x} = x^{\frac{3}{2}} - x^{\frac{1}{2}}$$

$$\frac{dy}{dx} = \left[\frac{3}{2}x^{\frac{1}{2}}\right] - \left[\frac{1}{2}x^{-\frac{1}{2}}\right] = \underline{\underline{\frac{3\sqrt{x}}{2} - \frac{1}{2\sqrt{x}}}}$$

$$32) R(x) = \frac{\sqrt{10}}{x^7} = \sqrt{10}x^{-7}$$

$$\frac{dR}{dx} = \sqrt{10}[-7x^{-8}] = \underline{\underline{\frac{-7\sqrt{10}}{x^8}}}}$$

$$34) y = \frac{x^2 - 2\sqrt{x}}{x} = \frac{x^2}{x} - \frac{2\sqrt{x}}{x} = x - \frac{2}{\sqrt{x}} = x - 2x^{-\frac{1}{2}}$$

$$\frac{dy}{dx} = [1] - 2\left[-\frac{1}{2}x^{-\frac{3}{2}}\right] = \underline{\underline{1 + \frac{1}{(\sqrt{x})^3}}}}$$

$$36) G(v) = ae^v + \frac{b}{v} + \frac{c}{v^2} = ae^v + bv^{-1} + cv^{-2}$$

$$\frac{dG}{dv} = a[e^v(1)] + b[-1v^{-2}] + c[-2v^{-3}] = ae^v - \frac{b}{v^2} - \frac{2c}{v^3}$$

$$38) u = \sqrt[3]{x^2} + 2\sqrt{x^3} = x^{\frac{2}{3}} + 2x^{\frac{3}{2}}$$

$$\frac{du}{dx} = \left[ \frac{2}{3} x^{-\frac{1}{3}} \right] + 2 \left[ \frac{3}{2} x^{\frac{1}{2}} \right] = \frac{2}{3\sqrt[3]{x}} + 3\sqrt{x}$$

$$40) g(x) = 7.6\sqrt{x} + 3.9x^2 = 7.6x^{\frac{1}{2}} + 3.9x^2$$

$$\boxed{x=12}$$

$$\frac{dg}{dx} = 7.6 \left[ \frac{1}{2} x^{-\frac{1}{2}} \right] + 3.9 [2x] = \frac{3.8}{\sqrt{x}} + 7.8x$$

$$m = \left. \frac{dg}{dx} \right|_{x=12} = \frac{3.8}{\sqrt{12}} + 7.8(12) = \frac{3.8}{2\sqrt{3}} + 7.8(3)(4) = \frac{1.9}{\sqrt{3}} + (23.4)(4)$$

$$= \frac{1.9}{\sqrt{3}} + 93.6$$

$$42) y = (1+2x)^2 = (1+4x+4x^2) \quad (1, 9)$$

$$\frac{dy}{dx} = [0] + 4[1] + 4[2x] = 4 + 8x$$

$$m = \left. \frac{dy}{dx} \right|_{x=1} = 4 + 8(1) = 12$$

$$y - (9) = 12(x - (1))$$

$$y - 9 = 12(x - 1)$$

$$y - 9 = 12x - 12$$

$$\underline{\underline{y = 12x - 3}}$$

$$58) G(r) = \sqrt{r} + \sqrt[3]{r} = r^{\frac{1}{2}} + r^{\frac{1}{3}}$$

$$\frac{dG}{dr} = \left[ \frac{1}{2} r^{-\frac{1}{2}} \right] + \left[ \frac{1}{3} r^{-\frac{2}{3}} \right] = \frac{1}{2} r^{-\frac{1}{2}} + \frac{1}{3} r^{-\frac{2}{3}} = \frac{1}{2\sqrt{r}} + \frac{1}{3(\sqrt[3]{r})^2}$$

$$\frac{d^2G}{dr^2} = \frac{1}{2} \left[ \frac{-1}{2} r^{-\frac{3}{2}} \right] + \frac{1}{3} \left[ \frac{-2}{3} r^{-\frac{5}{3}} \right] = \frac{-1}{4(\sqrt{r})^3} - \frac{2}{9(\sqrt[3]{r})^5}$$


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$$64) s = 2t^3 - 7t^2 + 4t + 1$$

$$a) v(t) = \frac{ds}{dt} = 2[3t^2] - 7[2t] + 4[1] + [0] = \underline{6t^2 - 14t + 4}$$

$$a(t) = \frac{dv}{dt} = \frac{d^2s}{dt^2} = 6[2t] - 14[1] + [0] = \underline{12t - 14}$$

$$b) a(1) = \left. \frac{d^2s}{dt^2} \right|_{t=1} = 12(1) - 14 = \underline{\underline{-2 \text{ m/sec}^2}}$$