

Answers to Worksheet 7 - Differentials and Product Rule

$$1) dy = (-2x - 4)dx$$

$$2) dy = -3x^2 dx$$

$$3) dy = -\frac{1}{2x^2} dx$$

$$4) dy = -\frac{1}{x^2} dx$$

$$\begin{aligned} 5) f'(t) &= \left(-t^{\frac{1}{6}} - 3\right) \cdot 3t^2 + (t^3 + 2) \cdot -\frac{1}{6}t^{-\frac{5}{6}} \\ &= -\frac{19t^{\frac{13}{6}}}{6} - 9t^2 - \frac{1}{3t^{\frac{5}{6}}} \end{aligned}$$

$$\begin{aligned} 6) \frac{dr}{ds} &= (1 - 3s^{-8})(8s^3 + 12s^2) + (2s^4 + 4s^3 + 4) \cdot 24s^{-9} \\ &= 8s^3 + 12s^2 + \frac{24}{s^5} + \frac{60}{s^6} + \frac{96}{s^9} \end{aligned}$$

$$\begin{aligned} 7) \frac{ds}{dx} &= \left(-2x^{\frac{5}{4}} - 5\right) \cdot -40x^9 + (-4x^{10} - 1) \cdot -\frac{5}{2}x^{\frac{1}{4}} \\ &= 90x^{\frac{41}{4}} + 200x^9 + \frac{5x^{\frac{1}{4}}}{2} \end{aligned}$$

$$\begin{aligned} 8) g'(r) &= \left(-4r^{\frac{1}{7}} - 1\right) \cdot -12r^3 - 3r^4 \cdot -\frac{4}{7}r^{-\frac{6}{7}} \\ &= \frac{348r^{\frac{22}{7}}}{7} + 12r^3 \end{aligned}$$

$$\begin{aligned} 9) g'(x) &= \left(-4x^{\frac{3}{8}} + 5\right) \cdot 5x^4 + (x^5 + 4) \cdot -\frac{3}{2}x^{-\frac{5}{8}} \\ &= -\frac{43x^{\frac{35}{8}}}{2} + 25x^4 - \frac{6}{x^{\frac{5}{8}}} \end{aligned}$$

$$\begin{aligned} 10) h'(w) &= \left(5w^{\frac{5}{9}} - 5\right) \cdot -3w^2 - w^3 \cdot \frac{25}{9}w^{-\frac{4}{9}} \\ &= -\frac{160w^{\frac{23}{9}}}{9} + 15w^2 \end{aligned}$$

$$11) \frac{dr}{ds} = (5s^4 - 2) \cdot \sec^2 s + \tan s \cdot 20s^3$$

$$12) \frac{dt}{dx} = \cos x \cdot 10x - (5x^2 - 3)\sin x$$

$$13) \frac{dg}{dt} = (-5t^2 + 4)\cos t - 10t\sin t$$

$$14) h'(3) = 0$$

$$15) h'(1) = 6$$

$$16) h'(5) = 0$$