Activity 10
Functioning on Your Own

Answers to Instructions: Part A

1. $x = 2.00365$

Answers to Instructions: Part B

1. implicit derivative = $\dfrac{-x^2}{y^2}$

2. $m = \dfrac{-4}{9}$

3. equation = $y - 3 = \dfrac{-4(x-2)}{9}$

4. $x^2\, y + xy^2 = 12$ at $(-4,1)$ has tangent line $y = \dfrac{7}{8}x + \dfrac{9}{2}$

   $x^2 + y^2 = 25$ at $(3,4)$ has tangent line $y = \dfrac{-3}{4}x + \dfrac{25}{4}$.

   $x = \cos(y)$ at $(\sqrt{2}/2, \pi/4)$ has tangent line
   $y = -\sqrt{2} \cdot x + \pi/4 + 1$.

Answers to Instructions: Part C

2. equation of related rates =

   $$2s \cdot \frac{ds}{dt} = 2x \cdot \frac{dx}{dt} + 2y \cdot \frac{dy}{dt}$$

   $$s = \sqrt{x^2 + y^2} = \sqrt{50^2 + 120^2} = 130$$

   $$\frac{ds}{dt} = \frac{x \cdot dx|dt + y \cdot dy|dt}{\sqrt{x^2 + y^2}} = \frac{50 \cdot 24 + 120 \cdot 18}{\sqrt{50^2 + 120^2}} = \frac{336}{13} \approx$$

   25.8 mi/hr

3. $ds = \dfrac{ds}{dt} = \dfrac{336}{13} \approx 25.8$ mi/hr

Teacher Information *(Continued)*

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(Continued)

Answers to Extra Practice

1. Differentiate both sides of $x^2 + y^2 = 18^2$ with respect to t to obtain

$$2x \cdot \frac{dx}{dt} + 2y \cdot \frac{dy}{dt} = 0 \Rightarrow \frac{dy}{dt} = \frac{-x \cdot dx|dt}{y} = \frac{-x \cdot dx|dt}{\sqrt{18^2 - x^2}}$$

$$= \frac{-10 \cdot 6}{\sqrt{18^2 - 10^2}} = \frac{-15\sqrt{14}}{14} \approx -4.0 \text{ ft/sec}$$

2. Because $V = 1.3\,\pi * r^3$, and $h = r$ is constant for the problem,

$$V = \frac{\pi \cdot h^3}{3} \Rightarrow \frac{dV}{dt} = \pi \cdot h^2 \cdot \frac{dh}{dt} \Rightarrow 10 = \pi \cdot 6^2 \cdot \frac{dh}{dt} \Rightarrow$$

$$\frac{dh}{dt} = \frac{5}{18\pi} \approx 0.09 \text{ ft/sec}$$