

ESP  
Kouba  
Worksheet 14 Solutions

$$1.) \text{ a.) } f'(x) = x^3 \cdot 2(3-5x) \cdot (-5) + 3x^2(3-5x)^2 \\ = x^2(3-5x) \cdot [-10x + 3(3-5x)] \\ = x^2(3-5x)[9-25x] = 0 \rightarrow$$

$$x=0, x=\frac{3}{5}, \text{ or } x=\frac{9}{25}$$

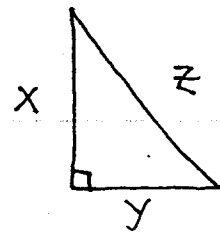
$$\text{b.) } f'(x) = x \cdot \frac{1}{2}(x-1)^{-\frac{1}{2}} + \sqrt{x-1} = \frac{x}{2\sqrt{x-1}} + \sqrt{x-1} \\ = \frac{x + 2(x-1)}{2\sqrt{x-1}} = \frac{3x-2}{2\sqrt{x-1}} = 0 \rightarrow 3x-2=0 \rightarrow$$

$x = \frac{2}{3}$  but  $x = \frac{2}{3}$  is not in the domain of  $f$  so there is no solution.

$$\text{c.) } f'(x) = \frac{(x^2-1)3x^2 - x^3 \cdot 2x}{(x^2-1)^2} = \frac{x^2(x^2-3)}{(x^2-1)^2} = 0 \rightarrow$$

$$x=0 \text{ or } x = \pm\sqrt{3}$$

$$2.) \frac{dx}{dt} = -5 \text{ in./sec. and } \frac{dy}{dt} = 7 \text{ in./sec.}$$



$$\text{a.) Find } \frac{dz}{dt} \text{ when } x=4 \text{ in. and } y=3 \text{ in. : } \\ x^2 + y^2 = z^2 \xrightarrow{D} 2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2z \frac{dz}{dt} \rightarrow \\ (4)(-5) + (3)(7) = (5) \frac{dz}{dt} \rightarrow \frac{dz}{dt} = \frac{1}{5} \text{ in./sec.}$$

$$\text{b.) Perimeter } P = x + y + z, \text{ find } \frac{dP}{dt} \text{ when } \\ x=4 \text{ in. and } y=3 \text{ in. :}$$