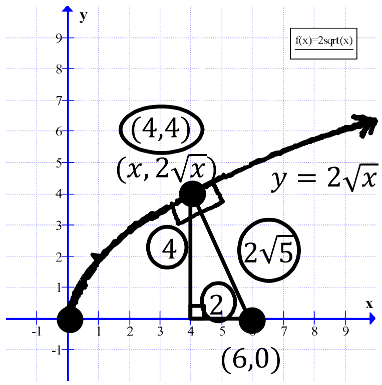
C12 - 3.7 - Distance/Eq Max/Min Notes

Shortest Distance from $2\sqrt{x}$ to pt (6,0).



$$\boxed{d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}}$$

$$d = \sqrt{((x) - (6))^2 + ((2\sqrt{x}) - (0))^2}$$

$$d = \sqrt{x^2 - 12x + 36 + 4x}$$

$$d = \sqrt{x^2 - 8x + 36}$$

$$d = (x^2 - 8x + 36)^{\frac{1}{2}}$$

$$d' = \frac{1}{2}(x^2 - 8x + 36)^{-\frac{1}{2}} \times (2x - 8)$$

$$d' = \frac{x - 4}{\sqrt{x^2 - 8x + 36}}$$

$$0 = \frac{x - 4}{\sqrt{x^2 - 8x + 36}}$$

$$0 = x - 4$$

$x = 4$ (4,4)

$y = 2\sqrt{x}$

$y = 2\sqrt{4}$

$y = 4$

$a^2 + b^2 = c^2$

$c = \sqrt{a^2 + b^2}$

$c = \sqrt{2^2 + 4^2}$

$c = 2\sqrt{5}$

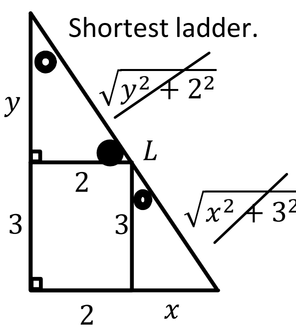
$$\boxed{y = \sqrt{f(x)} \qquad y' = \frac{f'(x)}{2\sqrt{f(x)}}}$$

$$\boxed{y = \sqrt{that} \qquad y' = \frac{chain\ that}{2\sqrt{that}}}$$

4

Min

Shortest ladder.



$$L = \sqrt{(x+2)^2 + (y+3)^2}$$

$$\frac{y}{2} = \frac{3}{x}$$

$$y = \frac{6}{x}$$

$$\boxed{L = \sqrt{y^2 + 2^2} + \sqrt{x^2 + 3^2}}$$

... Not Optimal

$$36\sqrt{x^2 - 9} = x^4\sqrt{36x^{-3} + 4}$$

$$L = \sqrt{(x+2)^2 + \left(\left(\frac{6}{x}\right) + 3\right)^2}$$

$$L = \sqrt{x^2 + 4x + 4 + \frac{36}{x^2} + \frac{18}{x} + 9}$$

$$L' = \cdots$$

$$0 = 2x + 4 - 72x^{-3} - 18x^{-2}$$

$$0 = 2x^4 + 4x^3 - 18x - 72$$

Graphing Calc/Factoring* $x = 2.0596$

$$L = \sqrt{(x+2)^2 + \left(\left(\frac{6}{x}\right) + 3\right)^2}$$

$$L = \sqrt{(2.0596 + 2)^2 + \left(\left(\frac{6}{2.0596}\right) + 3\right)^2}$$

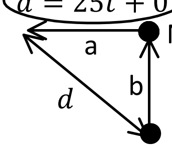
$$L = 7.17$$

Min Distance Between.

$let\ t = \#\ hrs\ after\ 12pm$

$$\frac{da}{dt} = 25\frac{km}{hr} \qquad \boxed{y = mx + b}$$

$$d = 25t + 0 \qquad \boxed{d_f = d_i + vt}$$



Noon (a=0,b=40)

$$\frac{db}{dt} = -20\frac{km}{hr}$$

$$d = -20t + 20$$

$$c = \sqrt{a^2 + b^2}$$

$$d = \sqrt{(25t)^2 + (-20t + 20)^2}$$

...

$$d' = \frac{2(25t)25 + 2(-20t + 20)(-20)}{2\sqrt{(25t)^2 + (-20t + 20)^2}}$$

...

$$0 = 2(25t)25 + 2(-20t + 20)(-20)$$

$$0 = 1250t + 800t - 800$$

$t = 0.39\ hr$ $\quad 0.39 \times 60 = 23.4\ min$

$12 + 23.4 \approx 12:23\ PM$

Can take Derivative of $a^2 + b^2$*

$a = vt$

$a = 25(0.39)$

$a = 9.75$

$b = vt$

$b = 20 - 20(0.39)$

$b = 12.2$

$c = \sqrt{a^2 + b^2}$

$c = 15.6\ km$

End Points: Noon (d=20km), 1pm (d=25km)

If b Arrives at 1pm Moving at 20km/h it was 20km at 12pm.