Circle $(x-2)^2 + (y-3)^2 = 2^2$

solve for y

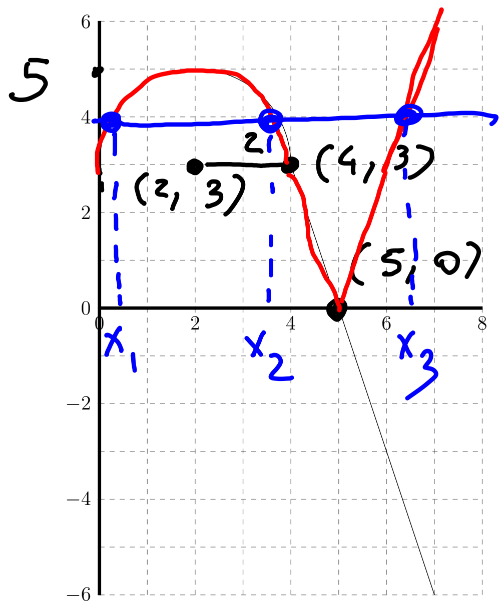
$$(y-3)^2 = 4 - (x-2)^2$$

$$(y-3) = \pm \sqrt{4-(x-2)^2}$$

$$y = 3 \pm \sqrt{4-(x-2)^2}$$

Formula for semicircle
used in next page

1. Below you are given the graph of a function $f(x)$, defined for $0 \leq x \leq 7$. The graph consists of a semicircle and a straight line, joined at the point (4,3).



Domain : $0 \leq x \leq 7$

Range : $[-6, 5]$

$|f(x)|$

(a) Write a formula for $f(x)$.

$$f(x) = \begin{cases} 3 + \sqrt{4 - (x-2)^2} & 0 \leq x \leq 4 \\ -3 \cdot (x-5) & 4 < x \leq 7 \end{cases}$$

(b) Find all solutions of $|f(x)| = 4$

$f(x) = 4$ if $f(x) \geq 0$ $\quad 0 \leq x \leq 5$

$-f(x) = 4$ if $f(x) < 0$ $\quad 7 \geq x \geq 5$

$$\overbrace{3 + \sqrt{4 - (x-2)^2}}^{f(x)} = 4$$

$$\sqrt{4 - (x-2)^2} = 1$$

$$4 - (x-2)^2 = 1$$

$$3 = (x-2)^2$$

$$\pm\sqrt{3} = x - 2$$

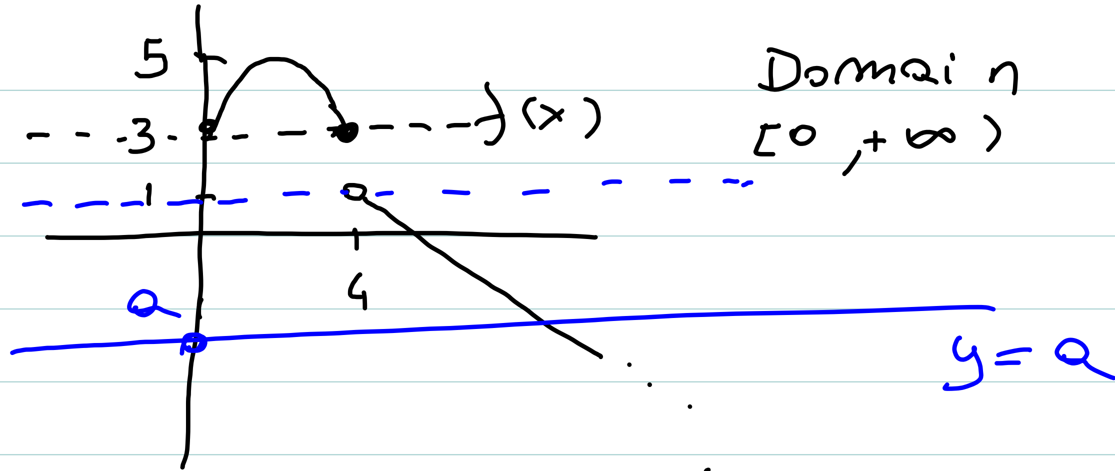
$$\boxed{2 \pm \sqrt{3} = x}$$

$$\overbrace{-(-3(x-5))}^{-f(x)} = 4$$

$$3(x-5) = 4$$

$$x - 5 = \frac{4}{3}$$

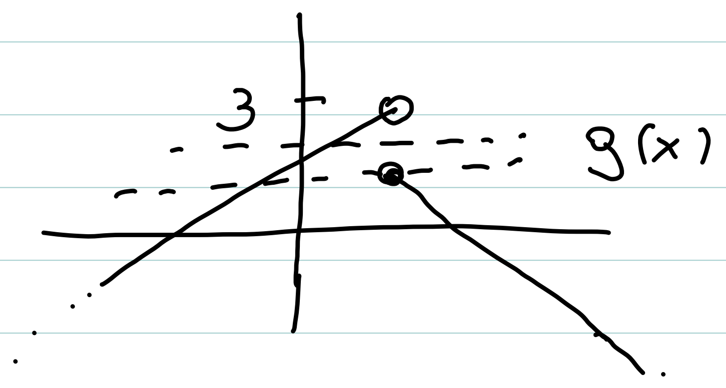
$$x = 5 + \frac{4}{3} = \frac{5 \cdot 3 + 4}{3} = \boxed{\frac{19}{3}}$$



Domain
$[0, +\infty)$

Find range of $f(x)$

$(-\infty, 1)$ and $[3, 5]$



Domain
$(-\infty, +\infty)$

Find range of $g(x)$

$(-\infty, 3)$

1. Your heating system starts at 6 am when the temperature inside your house is 63F; at 6:36 am the temperature has reached 67 F. Assuming that the temperature rises linearly, when does the temperature inside your house reach 69 F ? Give your answer in minutes after 6 am (for example 45 minutes after 6 am)

$t=0$ corresponds to 6 am

$(0, 63) \qquad (36, 67)$

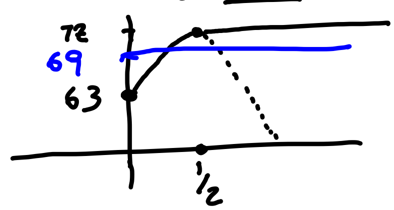
$f(t)=y = 63 + \frac{67-63}{36-0} \cdot t$ $\qquad$ y temperature, t time (after 6:00 am)

$69 = 63 + \frac{4}{36} t$

$\frac{6 \cdot 36}{4} = t$

$\boxed{t = 54 \text{ min}}$

A salesman wants to sell a new furnace. He tells you that if the temperature inside your house is 63F at 6:00 am, then it reaches a maximum of 72F in 30 minutes. Assume the temperature in the house can be modelled by a quadratic function until it reaches 72F, and then it stays constant. When does the temperature in your house reach 69 F ? Let $t = 0$ correspond to 6:00 am and give your answer in minutes after 6:00 am. Write a formula for a function $f(t)$ that gives the temperature of your house t hours after 6:00 am.



$t=0$ corresponds to 6 am

$(0, 63) \qquad (\frac{1}{2}, 72) = \text{vertex}$

$y = a(t-\frac{1}{2})^2 + 72$

$63 = a \frac{1}{4} + 72$; $\quad -9 = a \cdot \frac{1}{4}$; $\quad a = -36$

$y = -36(t-\frac{1}{2})^2 + 72$

$69 = -36(t-\frac{1}{2})^2 + 72$; $\quad +3 = +36(t-\frac{1}{2})^2$

$\frac{3}{36} = (t-\frac{1}{2})^2$; $\quad \pm\sqrt{\frac{1}{12}} = t - \frac{1}{2}$; $\quad t = \frac{1}{2} \pm \sqrt{\frac{1}{12}}$

$\boxed{t = \frac{1}{2} - \sqrt{\frac{1}{12}}}$

$$f(t) = \begin{cases} -36\left(t-\frac{1}{2}\right)^2+72 & 0 \le t \le \frac{1}{2} \\ 72 & t > \frac{1}{2} \end{cases}$$

Port Townsend $

(h) When will the Seattle sales price be double the Port Townsend sales price? (Round your answer to to the nearest whole number.)

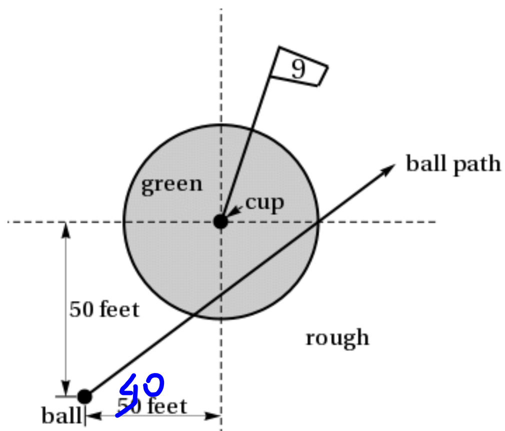
(i) Is the Port Townsend sales price ever double the Seattle sales price?

Yes

No

4. **0/5 points** UWAPreCalc1 4.P.006. [2735834] -

The cup on the 9th hole of a golf course is located dead center in the middle of a circular green that is ~~90~~ 70 feet in diameter. Your ball is located as in the picture below:



The ball follows a straight line path and exits the green at the right-most edge. Assume the ball travels a constant rate of 10 ft/sec. (Let the coordinates of the cup be $(x, y) = (0, 0)$.)

(a) Where does the ball enter the green? (Round your answer to four decimal places.)

$(x, y) = (\quad)$

(b) When does the ball enter the green? (Round your answer to two decimal places.)

sec

(c) How long does the ball spend inside the green? (Round your answer to two decimal places.)

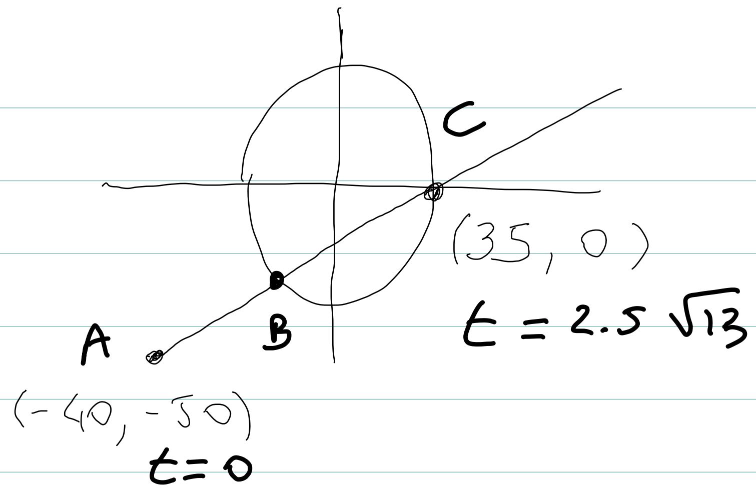
sec

(d) Where is the ball located when it is closest to the cup? (Round your answer to four decimal places.)

$(x, y) = (\quad)$

When is the ball closest to the cup? (Round your answer to two decimal places.)

sec



speed is 10 feet/sec

$$x^2 + y^2 = 35^2$$

Find parametric coordinates of motion for the ball

$$d(A,C) = \sqrt{75^2 + 50^2} = \sqrt{(25\cdot 3)^2 + (25\cdot 2)^2}$$

$$= \sqrt{25^2\cdot 9 + 25^2\cdot 4} = \sqrt{25^2(9+4)} = \sqrt{25^2\cdot 13}$$

$$= 25\sqrt{13}$$

$$t = d/v = \frac{25\sqrt{13}}{10} = 2.5\sqrt{13}$$

Parametric equations

$$x = -40 + \frac{75\cdot 2}{2.5\cdot\sqrt{13}\cdot 2}\,t = -40 + \frac{30}{\sqrt{13}}\,t$$

$$y = -50 + \frac{50\cdot 2}{2.5\sqrt{13}\cdot 2}\,t = -50 + \frac{20}{\sqrt{13}}\,t$$

Plug in into equation of circle

$$\left(-40 + \frac{30}{\sqrt{13}}t\right)^2 + \left(-50 + \frac{20}{\sqrt{13}}t\right)^2 = 35^2$$

$$\left(-40+\frac{30}{\sqrt{13}}t\right)^2+\left(-50+\frac{20}{\sqrt{13}}t\right)^2=35^2$$

$$1600-\frac{2\cdot 40\cdot 30}{\sqrt{13}}t+\frac{900}{13}t^2+2500-\frac{2\cdot 50\cdot 20}{\sqrt{13}}t+\frac{400}{13}t^2=35^2$$

$$\frac{1300}{13}t^2-\frac{4400}{\sqrt{13}}t+2875=0$$

$$t=\frac{\frac{4400}{\sqrt{13}}\pm\sqrt{\left(\frac{4400}{\sqrt{13}}\right)^2-\frac{4\cdot 1300\cdot 2875}{13}}}{\frac{2\cdot 1300}{13}}=\frac{\frac{4400}{\sqrt{13}}\pm\sqrt{\frac{4410000}{13}}}{\frac{2\cdot 1300}{13}}$$

$$t=\left(\frac{4400}{\sqrt{13}}\pm\frac{2100}{\sqrt{13}}\right)\cdot\frac{13}{2\cdot 1300}.$$

$$t_1=\frac{2300}{\sqrt{13}}\cdot\frac{13}{2\cdot 1300}=\frac{23}{26}\sqrt{13} \qquad \text{or}$$

this is the time when ball enters the field.

$$t=\frac{6500}{\sqrt{13}}\cdot\frac{13}{2\cdot 1300}=\frac{65}{26}\sqrt{13}$$

t_2 this is the time the ball exits the field

Using parametric equations:

$$x = -40 + \frac{30}{\sqrt{13}} t$$

$$y = -50 + \frac{20}{\sqrt{13}} t$$

plug in $t_1 = \frac{23}{26}\sqrt{13}$

$$x = -40 + \frac{\cancel{30}^{15}}{\cancel{\sqrt{13}}} \cdot \frac{23}{\cancel{26}_{13}} \cancel{\sqrt{13}} = \frac{-40 \cdot 13 + 15 \cdot 23}{13} = \boxed{\frac{140}{13}}$$

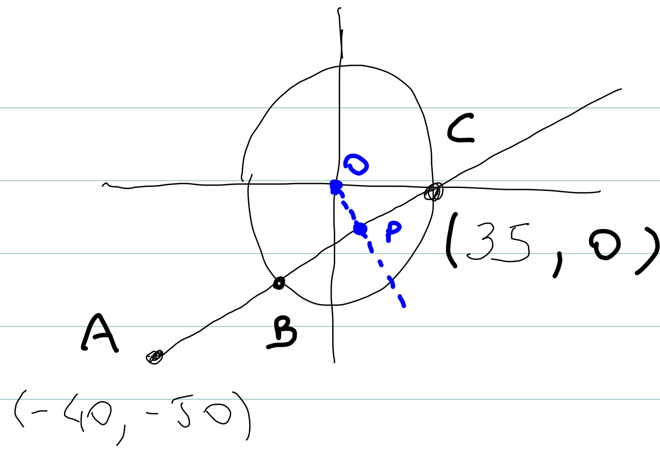
$$y = -50 + \frac{\cancel{20}^{10}}{\cancel{\sqrt{13}}} \frac{23}{\cancel{26}_{13}} \cancel{\sqrt{13}} = \frac{-50 \cdot 13 + 230}{13} = \boxed{\frac{-210}{13}}$$

These are the coordinates of B

$$t_2 - t_1 = \frac{65}{26}\sqrt{13} - \frac{23}{26}\sqrt{13} = \left(\frac{65}{26} - \frac{23}{26}\right)\sqrt{13}$$

$$= \frac{42}{26}\sqrt{13} = \boxed{\frac{21}{13}\sqrt{13}}$$

This is how long the ball spends inside the green



Method 1 for c)

1) Find equation of line AC

$y = \frac{50}{75}(x-35)$ $\qquad$ $y = \frac{2}{3}(x-35)$

2) Find line OP $\qquad$ $y = -\frac{3}{2}x$

3) Find P: $\quad -\frac{3}{2}x = \frac{2}{3}(x-35)$

$$-\frac{3}{2}x = \frac{2}{3}x - \frac{70}{3}$$

$$\frac{70}{3} = \frac{2}{3}x + \frac{3}{2}x = \frac{4+9}{6}x$$

$$\frac{70}{3} \cdot \frac{6}{13} = x$$

$x = \frac{140}{13}$ $\qquad$ $y = -\frac{3}{2} \cdot \frac{140}{13} = -\frac{210}{13}$.

P is $\left(\frac{140}{13}, -\frac{210}{13}\right)$

To find when the ball is closest to the cup, use parametric equations

$$x = -40 + \frac{30}{\sqrt{13}} t$$

$$y = -50 + \frac{20}{\sqrt{13}} t$$

Plug in $x = \frac{140}{13}$ and solve for t

$$\frac{140}{13} = -40 + \frac{30}{\sqrt{13}} t \; ; \; \left(\frac{140}{13} + \frac{40 \cdot 13}{13}\right) = \frac{30}{\sqrt{13}} t$$

$$t = \frac{660}{13} \cdot \frac{\sqrt{13}}{30} \; ; \quad t = \frac{22}{\sqrt{13}} \approx 6.10$$

Alternatively you could plug in $y = -\frac{210}{13}$ and solve for t