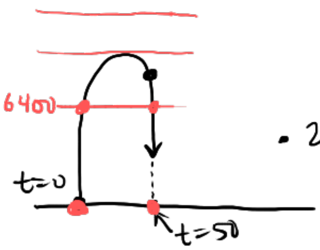


height $= h = -16t^2 + 800t$ t sec.

• When does it hit ground? When $h = 0$. Solve:

$$0 = -16t^2 + 800t$$
$$= -16t(t - 50)$$
$$\Rightarrow t = 0 \text{ or } t = 50.$$

— set —

•(3) when is height $= 6400' = h$

$$6400 = -16t^2 + 800t \iff 16t^2 - 800t + 6400 = 0$$
$$\frac{\cancel{16}(t^2 - 50t + 400)}{\cancel{16}} = \frac{0}{16} = 0$$
$$(t-10)(t-40) = 0 \Rightarrow t = 10,\ t = 40$$

4) $2 \cdot 5280 = -16t^2 + 800t \xrightarrow{\text{rearraange}} 16t^2 - 800t + 10560 = 0$

$$t^2 - 50t + 660 = 0$$

$$x = \frac{-(-50) \pm \sqrt{50^2 - 4 \cdot 1 \cdot 660}}{2}$$

$$= \frac{50 \pm \sqrt{-140}}{2}$$

no real sol's. this means the object never gets 2 miles up.

(5)  let's find the max height. we have 1 tool: standard form of a quadratic

$$h = -16t^2 + 800t$$

$$\boxed{y = a(x-h)^2 + k}$$

a: sign determines ↺ or ↻ k: peak/trough

complete the square: $\left(\frac{-50}{2}\right)^2 =$

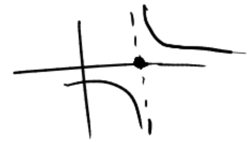
$$h = -16(t^2 - 50t \quad)$$
$$h = -16(\underbrace{t^2 - 50t + 625}) - 625 \cdot (-16)$$
$$h = -16(t-25)^2 + 10000$$

So: object has a max height of 10000 occurring @ 25 sec.

Inequalities — 1.7

① $\dfrac{2x+1}{x-5} \le 3 \Rightarrow \dfrac{2x+1}{x-5} - 3\left(\dfrac{x-5}{x-5}\right) \le 0$

$-3x+15$



$\dfrac{2x-3x+1+15}{x-5} = \dfrac{16-x}{x-5} \le 0$

$\boxed{\text{signs can switch when num} = 0 \text{ or den} = 0}$

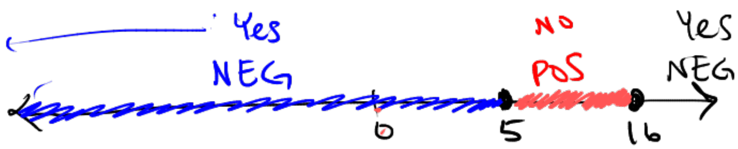
$(-\infty, 5)$ is part of my solution

set $16-x=0$

$x=16$

$x-5=0$

$x=5$



$(-\infty, 5) \cup [16, \infty)$

$\dfrac{+}{+} = +$

2. $1 + \dfrac{2}{x+1} \le \dfrac{2}{x}$ common denom is $x(x+1)$

$\dfrac{x(x+1)}{x(x+1)} + \dfrac{2x}{x(x+1)} - \dfrac{2(x+1)}{x(x+1)} \le 0$

Test Me!!

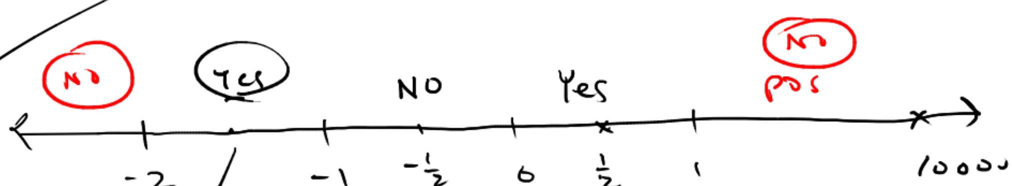
$\dfrac{x^2+x+2x-2x-2}{x(x+1)} = \dfrac{x^2+x-2}{x(x+1)} = \boxed{\dfrac{(x+2)(x-1)}{x(x+1)} \le 0}$

Now set num $=0$, den $=0$, solve. ~~These~~ create testing regions

$x=0$ $x=-2$

$x=-1$ $x=1$

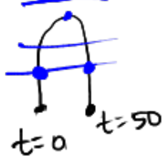
$-\dfrac{x^2+x}{x^2+x}$



$\dfrac{(+)(+)}{(-)(-)}$ $\dfrac{(+)(-)}{(-)(+)}$ $\dfrac{(+)(-)}{+} = (-)$

$h = -16t^2 + 800t$

$h =$ height above ground, $t =$ seconds



1. when does it return to ground ($h=0$)

$$0 = -16t^2 + 800t = -16(t^2 - 50t) = \underbrace{-16t}_{=0}\underbrace{(t-50)}_{=0}$$

$t=0$ or $t=50$

3. When is $h = 6400 = -16t^2 + 800t \Rightarrow 16t^2 - 800t + 6400 = 0$

$t=40$ or $t=10$ $\Leftarrow (t-40)(t-10) = \frac{16(t^2 - 50t + 400)}{16} = \frac{0}{16} = 0$

4. $\overbrace{2 \cdot 5280}^{10560} = -16t^2 + 800t \Rightarrow \boxed{16t^2 - 800t + 10560 = 0}$

$t^2 - 50t + 660 = 0$

sols are

$$t = \frac{50 \pm \sqrt{2500 - 4 \cdot 1 \cdot 660}}{2}$$

since $2500 - 4 \cdot 660 = -140$
$\Rightarrow$ no real solutions
$\Rightarrow$ object never hit 2 mi.

5  what's the highest point. We have 1 tool to solve this: standard form of a parabola.

$$y = a\underbrace{(x-h)}_{\text{x-value where extreme ht. is taken}}^2 + k$$

k → maximum value / peak ($a>0$)
→ min value ($a<0$)

start with: $-16t^2 + 800t$

complete the □:

factor: $-16(\underbrace{t^2 - 50t + 625}) - 625(-16)$

$\left(-\frac{50}{2}\right)^2 = 625$

$$\boxed{h = -16(t-25)^2 + 10000}$$

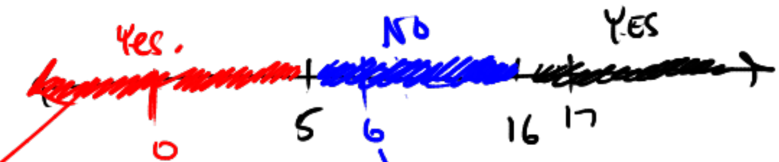
→ max ht = 10000

1. $\dfrac{2x+1}{x-5} \le 3 \Rightarrow \dfrac{2x+1}{x-5} - 3\left(\dfrac{x-5}{x-5}\right) \le 0$

$\dfrac{2x+1-3x+15}{x-5} = \boxed{\dfrac{16-x}{x-5} \le 0}$

$16-x=0 \quad x=16$

$x-5=0 \quad x=5$



TRUE

$\mathbb{R}$

$\dfrac{-1}{12} \le 0$

$\dfrac{16-17}{17-5}$

TRUE

$\dfrac{16-0}{0-5} = \dfrac{16}{-5} \le 0$

FALSE

$\dfrac{16-6}{6-5} = \dfrac{10}{1} = 10 \not\le 0$

sol'n: $(-\infty, 5) \cup [16, \infty)$

2. $1 + \dfrac{2}{x+1} \le \dfrac{2}{x}$

common den $= x(x+1)$

$x^2+x \quad +2x \quad -2x-2 \longrightarrow x^2+x-2$

$\dfrac{x(x+1)}{x(x+1)} + \dfrac{2x}{x(x+1)} - \dfrac{2(x+1)}{x(x+1)} \le 0$

$\dfrac{(+)(-)}{(+)(+)} \le 0$

$$\boxed{\dfrac{\overset{=0}{(x+2)}\overset{=0}{(x-1)}}{\underset{=0}{x}\underset{=0}{(x+1)}} \le 0}$$

$\dfrac{(+)(-)}{(-)(+)} \not\le 0$

sol'n $(-2,-1) \cup (0,1]$

$1 = \dfrac{1}{1} = \dfrac{x^2}{x^2} = \dfrac{x^2 + \cancel{x} - 2}{x^2+\cancel{x}}$