College Algebra — Joysheet 9 **MAT 140, Fall 2020 — D. Ivanšić**	**Name:** Saul Ocean *Covers: 3.3, 3.4, 3.5 Show all your work!*

1. (4pts) Solve the equation.

$|4x-5|=7$

$4x-5=7$ or $4x-5=-7$

$4x=12$ $\quad$ $4x=-2$

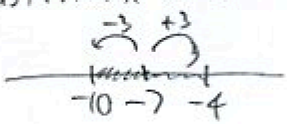
$x=3$ or $x=-\frac{1}{2}$

2. (12pts) Solve the inequalities. Draw your solution and write it in interval form.

$|x+7|\le 3$

$|x-(-7)|\le 3$

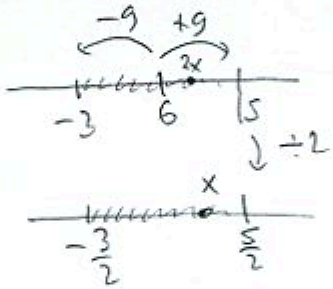
dist. from x to $-7\le 3$



$[-10,-4]$

$|2x-6|<9$

dist. from $2x$ to $6<9$



$\left(-\frac{3}{2},\frac{15}{2}\right)$

Solve the equations:

3. (8pts) $\dfrac{x+3}{x+1}+\dfrac{8x}{x^2-6x-7}=\dfrac{7}{x-7}$ $\;|\cdot(x-7)(x+1)$

$(x-7)(x+1)$

$\frac{x+3}{\cancel{x+1}}\cdot(\cancel{x+1})(x-7)+\frac{8x\cdot(\cancel{x-7})(\cancel{x+1})}{(\cancel{x-7})(\cancel{x+1})}=\frac{7}{\cancel{x-7}}\cdot(\cancel{x-7})(x+1)$

$(x+3)(x-7)+8x=7(x+1)$

$x^2-4x-21+8x=7x+7 \quad |-7x-7$

$x^2-3x-28=0$

$(x-7)(x+4)=0$

$x=\cancel{7}$ or -4

gives 0 in denominator

$\boxed{\text{Sol: } x=-4}$

4. (8pts) $x+\sqrt{40-3x}=4$

$\sqrt{40-3x}=4-x \quad |^2$

$40-3x=16-2\cdot 4\cdot x+x^2 \quad |-40+3x$

$x^2-8x+16+3x-40=0$

$x^2-5x-24=0$

$(x-8)(x+3)=0$

$x=8,-3$

$\boxed{\text{Sol: } x=-3}$

Check: $8+\sqrt{40-3\cdot 8}\overset{?}{=}4$

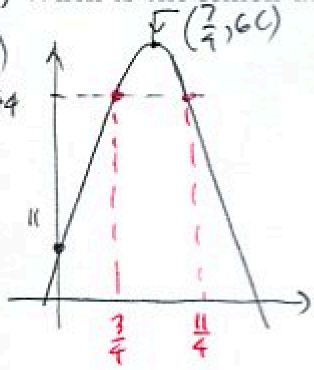
$8+\sqrt{16}=4$ no

$-3+\sqrt{40-3(-3)}\overset{?}{=}4$

$-3+\sqrt{49}\overset{?}{=}4$ yes

5. (14pts) A lemon is launched from height 11 feet upwards with initial velocity 56 feet per second. Its height in feet after t seconds is given by $s(t) = -16t^2 + 56t + 11$.
a) Sketch the graph of the height function.
b) When does the lemon reach its greatest height, and what is that height?
c) When is the lemon at height 44 feet?

a)



b) $h = -\frac{b}{2a} = -\frac{56}{2\cdot(-16)} = \frac{56}{32} = \frac{7}{4}$

$k = -16\cdot\left(\frac{7}{4}\right)^2 + \cancel{56}^{14}\cdot\frac{7}{\cancel{4}_1} + 11 = -\cancel{16}\cdot\frac{49}{\cancel{16}} + 98 + 11 = 60$

Max height is 60 ft.

c) $s(t) = 44$

$-16t^2 + 56t + 11 = 44$

$-16t^2 + 56t - 33 = 0$

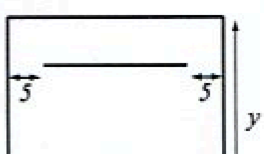
$16t^2 - 56t + 33 = 0$

$t = \frac{-(-56) \pm \sqrt{(-56)^2 - 4\cdot 16\cdot 33}}{2\cdot 16}$

$= \frac{56 \pm \sqrt{1024}}{32} = \frac{56 \pm 32}{32} = \frac{88}{32}, \frac{24}{32}$

$= \frac{11}{4}, \frac{3}{4}$ It is at height 44 ft at time $\frac{3}{4}$ sec and $\frac{11}{4}$ sec.

6. (14pts) Matthew is building a gas station convenience store with the floor plan below. Openings of 5 feet are left for restroom doors and another opening of 10 feet is left for the entrance door. Matthew has budgeted for 500 ft of walls and wishes to maximize the area of the store.
a) Express the total area of the store as a function of one of the sides of the rectangle. What is the domain of this function?
b) Sketch the graph of the area function in order to find the maximum (no need for the graphing calculator — you should already know what the graph looks like). What are the dimensions of the store that has the greatest total area? What is the greatest total area possible?



$A = xy = x\left(260 - \frac{3}{2}x\right) = -\frac{3}{2}x^2 + 260x$

$x - 10 + x - 10 + x + 2y = 500$

$3x + 2y = 520$

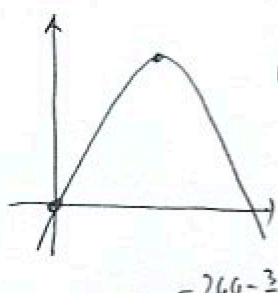
$2y = 520 - 3x$

$y = 260 - \frac{3}{2}x$

$h = -\frac{b}{2a} = -\frac{260}{2(-\frac{3}{2})} = \frac{260}{3} = 86.66667$

$k = \frac{260}{3}\cdot\left(260 - \frac{3}{2}\cdot\frac{260}{3}\right)$

$= \frac{260}{3}\cdot 130 = 11{,}266.66667$



Domain:
Must have $x \geq 10$

$y \geq 0$

$260 - \frac{3}{2}x \geq 0$

$260 \geq \frac{3}{2}x \quad \cdot\frac{2}{3}$

$x \leq 260\cdot\frac{2}{3} = \frac{520}{3}$

Domain:

$\left[10, \frac{520}{3}\right]$

$= [10, 173.33333]$

Dimensions: $\frac{260}{3} \times 130$ feet

$260 - \frac{3}{2}\cdot\frac{260}{3}$

Max. area: 11,266.66667 square feet