Algebra and Trigonometry — Joysheet 7 **MAT 150, Fall 2017 — D. Ivanšić**	**Name:** Saul Ocean *Covers: 3.3, 3.4, 3.5 Show all your work!*

1. (4pts) Solve the equation.

$|2x-1|=4$

$2x-1=4$ or $2x-1=-4$

$2x=5$ $\quad$ $2x=-3$

$x=\frac{5}{2}$ or $x=-\frac{3}{2}$

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

$|x+8|<3$

$|x-(-8)|<3$

dist. from x to $-8<3$

-3 $\quad$ $+3$

-11 $\quad$ -8 $\quad$ -5

$(-11,-5)$

$|5x-6|\geq 9$

dist. from $5x$ to $6 \geq 9$

-9 $\quad$ $+9$ $\quad$ $5x$

-3 $\quad$ 6 $\quad$ 15 $\quad$ $\div 5$

$-\frac{3}{5}$ $\quad$ 3

$(-\infty,-\frac{3}{5}]\cup[3,\infty)$

Solve the equations:

3. (8pts) $\dfrac{2x+1}{x-6}-\dfrac{16x+21}{x^2-3x-18}=\dfrac{x-4}{x+3}$ $\quad \big| \cdot (x-6)(x+3)$

$(x-6)(x+3)$

$\frac{2x+1}{\cancel{x-6}}\cdot\cancel{(x-6)}(x+3)-\frac{16x+21}{\cancel{(x-6)}\cancel{(x+3)}}\cancel{(x-6)}\cancel{(x+3)}=\frac{x-4}{\cancel{x+3}}(x-6)\cancel{(x+3)}$

$(2x+1)(x+3)-(16x+21)=(x-4)(x-6)$

$2x^2+7x+3-16x-21=x^2-10x+24$ $\quad | -x^2+10x-24$

$x^2+x-42=0$

$(x+7)(x-6)=0$

$x=-7, 6$ $\quad$ $\boxed{x=-7}$

$x=6$ not a solution, since it gives a 0 in the denom.

4. (8pts) $3x+\sqrt{26-5x}=2x+4$ $\quad |-3x$

$\sqrt{26-5x}=4-x$ $\quad |^2$

$26-5x=16-8x+x^2$ $\quad |-26+5x$

$x^2-3x-10=0$

$(x-5)(x+2)=0$

$x=5,-2$ $\quad$ $\boxed{x=-2}$

check

$x=5$ $\quad$ $15+\sqrt{26-25}\stackrel{?}{=}10+4$

$15+1\stackrel{?}{=}14$ no

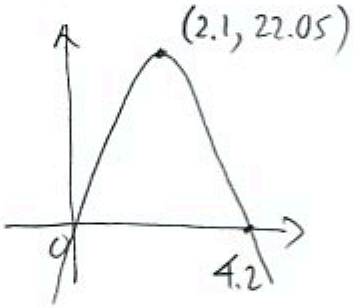
$x=-2$ $\quad$ $-6+\sqrt{26+10}\stackrel{?}{=}-4+4$

$-6+6\stackrel{?}{=}0$ yes

5. (14pts) A ball is thrown upwards from the ground with initial velocity 21 meters per second. Its height in meters after t seconds is given by $s(t) = -5t^2 + 21t$.
a) Sketch the graph of the height function.
b) When does the ball reach its greatest height, and what is that height?
c) When is the ball at height 21 meters? [meant to be 22]

a) $t(-5t+21)=0$

$t=0$ or $\frac{21}{5}=4.2$



b) vertex is

$h=-\frac{21}{2\cdot(-5)}=\frac{21}{10}=2.1$

$k=-5\cdot 2.1^2+21\cdot 2.1$

$=22.05$

Greatest height of 22.05 m is reached after 2.1 seconds

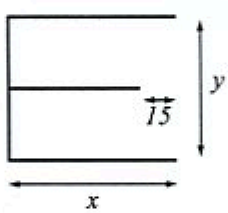
c) $-5t^2+21t=21$

$5t^2-21t+21=0$

$t=\frac{-(-21)\pm\sqrt{(-21)^2-4\cdot 5\cdot 21}}{2\cdot 5}$

$=\frac{21\pm\sqrt{21}}{10}=\begin{matrix}2.558258\\1.641742\end{matrix}$

6. (14pts) Truck mechanic Igor wishes to build a repair shop with two side-by-side bays separated by a shorter wall (see picture). Igor has enough money to build 900 feet of walls, and he wants to build a shop with maximal area.
a) Express the total area of the shop 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 shop that has the greatest total area? What is the greatest area possible?



a) $A=xy$

$900=2x+x-15+y$

$900=3x+y-15$

so $y=915-3x$

$A=x(915-3x)$

$=-3x^2+915x$

Domain:
Must have:

$x\geq 15$

$y\geq 0$, i.e.,

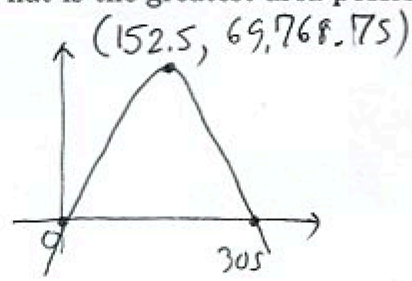
$915-3x\geq 0$

$3x\leq 915 \quad |\div 3$

$x\leq 305$

$[15,305]$

b)



vertex: $h=-\frac{915}{2\cdot(-3)}=152.5$

$k=-3\cdot 152.5^2+915\cdot 152.5=69768.75$

$915-3\cdot 152.5$

Dimensions: 152.5×457.5 ft

Max area: 69768.75 sq. ft