**College Algebra — Joysheet 9**
**MAT 140, Fall 2019 — D. Ivanšić**

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*Covers: 3.3, 3.4, 3.5 Show all your work!*

**1.** (4pts) Solve the equation.

$|3x+11|=7$

$3x+11=7$ or $3x+11=-7$

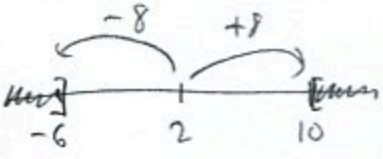
$3x=-4$ $\quad 3x=-18$

$x=-\frac{4}{3}$ or $x=-6$

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

$|x-2|\geq 8$

distance from $x$ to $2 \geq 8$

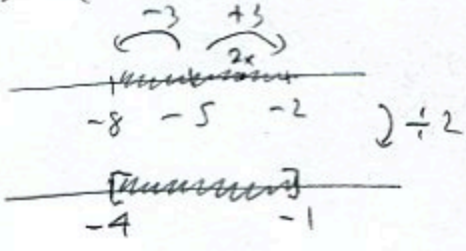



$(-\infty,-6]\cup[10,\infty)$

$|2x+5|<3$

$|2x-(-5)|<3$

distance from $2x$ to $-5 < 3$




$[-4,-1]$

Solve the equations:

**3.** (8pts) $1+\frac{7}{x-3}=\frac{x+25}{x^2-2x-3}$ $\quad |\cdot(x-3)(x+1)$

$(x-3)(x+1)$

$1\cdot(x-3)(x+1)+\frac{7}{x-3}(x-3)(x+1)=\frac{x+25}{(x-3)(x+1)}(x-3)(x+1)$

$x^2-2x-3+7(x+1)=x+25 \quad |-x-25$

$x^2-2x-3+7x+7-x-25=0$

$x^2+4x-21=0$

$(x+7)(x-3)=0$

$x=-7,3$

Since 3 gives 0 in denom. in original equation, only $x=-7$ is the solution

**4.** (8pts) $x+3+\sqrt{4x+17}=0 \quad |-x-3$

$\sqrt{4x+17}=-x-3 \quad |^2$ note $(-(x+3))^2=(x+3)^2$

$4x+17=x^2+6x+9 \quad |-4x-17$

$x^2+2x-8=0$

$(x+4)(x-2)=0$

$x=-4,2$

check: $-4+3+\sqrt{-16+17}=0$?

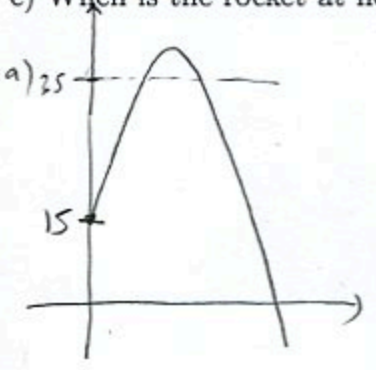
$-4+3+1=0$ yes

$2+3+\sqrt{8+17}=0$?

$5+5=0$ no

$x=-4$ is the only solution

**5.** (14pts) A toy rocket is launched from height 15 feet upwards with initial velocity 48 feet per second. Its height in meters after $t$ seconds is given by $s(t) = -16t^2 + 48t + 15$.
a) Sketch the graph of the height function.
b) When does the rocket reach its greatest height, and what is that height?
c) When is the rocket at height 35 feet?




b) Vertex: $h = -\frac{48}{2\cdot(-16)} = \frac{48}{32} = \frac{3}{2}$ s

$k = -16\cdot\frac{9}{4} + 48\cdot\frac{3}{2} + 15 = -36 + 72 + 15 = 51$ feet

Rocket reaches greatest height when $t = \frac{3}{2}$ seconds

Greatest height is 51 feet.

c) $-16t^2 + 48t + 15 = 35$

$-16t^2 + 48t - 20 = 0 \quad |\div 4$

$4t^2 - 12t + 5 = 0$

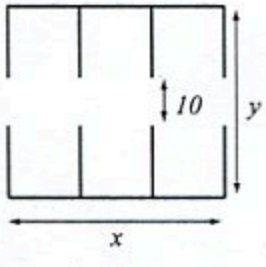
$t = \frac{-(-12) \pm \sqrt{(-12)^2 - 4\cdot 4\cdot 5}}{2\cdot 4}$

$= \frac{12 \pm \sqrt{144 - 80}}{8} = \frac{12 \pm \sqrt{64}}{8}$

$= \frac{12 \pm 8}{8} = \frac{20}{8}, \frac{4}{8} = \frac{5}{2}, \frac{1}{2}$

At time $t = \frac{1}{2}$ and $\frac{5}{2}$.

**6.** (14pts) Jacinda is building a stable with six stalls with a gap between them of 10 feet. She has budgeted for 1200 ft of walls and wishes to maximize the area of the stable.
a) Express the total area of the stable 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 stable that has the greatest total area? What is the greatest total area possible?




$2x + 4(y - 10) = 1200$

$2x + 4y - 40 = 1200$

$2x + 4y = 1240$

$x = \frac{1240 - 4y}{2} = 620 - 2y$

$A = xy = (620 - 2y)\cdot y$

$= -2y^2 + 620y$

Must have:

$y \geq 10$

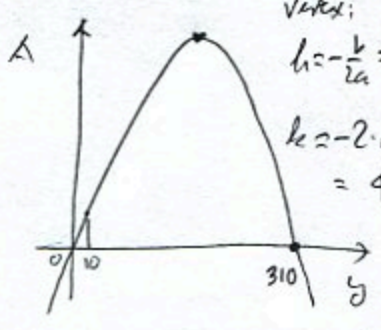
$x \geq 0$, that is

$620 - 2y \geq 0$

$2y \leq 620$

$y \leq 310$

Domain is $[10, 310]$




Vertex:

$h = -\frac{b}{2a} = -\frac{620}{2\cdot(-2)} = 155$

$k = -2\cdot 155^2 + 620\cdot 155 = 48050$

Dimensions for greatest area:

$620 - 2\cdot 155$ $\quad y$

$310 \times 155$ ft

Max. area is 48050 square feet.