College Algebra — Joysheet 9
MAT 140, Fall 2015 — D. Ivanšić

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

1. (4pts) Solve the equation.

$|7x-2|=30$

$7x-2=30$ or $7x-2=-30$

$7x=32$ or $7x=-28$

$x=\frac{32}{7}$ or $x=-4$

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

$|x+3|\geq 4$

$|x-(-3)|\geq 4$

distance from x to $-3\geq 4$

-4 $+4$

-7 -3 1

$(-\infty,-7]\cup[1,\infty)$

$|3x-5|<7$

distance from $3x$ to $5<7$

-7 $+7$

-2 5 12

$3x$

$-\frac{2}{3}$ x 4

$\left(-\frac{2}{3},4\right)$

Solve the equations:

3. (8pts) $\dfrac{x}{x+1}+\dfrac{10}{x+3}=\dfrac{2x^2+9x-11}{x^2+4x+3}$ $\Big|\cdot(x+1)(x+3)$

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

$\dfrac{x}{\cancel{x+1}}\cancel{(x+1)}(x+3)+\dfrac{10}{\cancel{x+3}}(x+1)\cancel{(x+3)}=\dfrac{2x^2+9x-11}{\cancel{(x+1)}\cancel{(x+3)}}\cancel{(x+1)}\cancel{(x+3)}$

$x(x+3)+10(x+1)=2x^2+9x-11$

$x^2+3x+10x+10=2x^2+9x-11$

$x^2+13x+10=2x^2+9x-11$

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

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

$x=7,-3$

↑ gives 0 in denom

Sol: $x=7$

4. (8pts) $\sqrt{x+45}-x=3$

$\sqrt{x+45}=3+x \quad |^2$

$x+45=x^2+6x+9$

$x^2+5x-36=0$

$(x+9)(x-4)=0$

$x=-9,4$

$x=4$ is sol.

Check

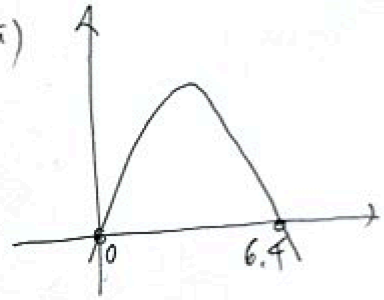
$\sqrt{-9+45}-(-9)\stackrel{?}{=}3$ $\qquad$ $\sqrt{4+45}-4\stackrel{?}{=}3$

$6+9\stackrel{?}{=}3$ $\qquad$ $7-4\stackrel{?}{=}3$

no $\qquad$ yes

5. (14pts) A ball is thrown upwards from the ground with initial velocity 32 meters per second. Its height in meters after t seconds is given by $s(t) = -5t^2 + 32t$.
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 44 meters?

a)



$-5t^2+32t=0$

$t(-5t+32)=0$

$t=0,\ \frac{32}{5}=6.4$

b) Greatest height at vertex

$t=-\frac{b}{2a}=-\frac{32}{2\cdot(-5)}=\frac{32}{10}=3.2$

$\text{height}=-5\cdot 3.2^2+32\cdot 3.2=51.2$ meters

c) $-5t^2+32t=44$

$-5t^2+32t-44=0$

$5t^2-32t+44=0.$

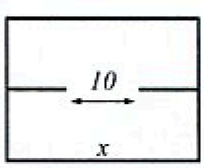
$t=\frac{-(-32)\pm\sqrt{(-32)^2-4\cdot5\cdot44}}{2\cdot5}$

$=\frac{32\pm\sqrt{1024-880}}{10}=\frac{32\pm\sqrt{144}}{10}$

$=\frac{32\pm12}{10}=4.4,\ 2$

After 2 seconds (going up) and 4.4 seconds (going down)

6. (14pts) You are building a simple rectangular building with two rooms and a 10-ft opening between them and have enough money to build 300 feet of walls (see picture). Your goal is to maximize the enclosed area.
a) Express the area of the building as a function of one of the sides of the rectangle. What is the domain of this function?
~~e~~ 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 building that has the greatest area and what is the greatest area possible?



a) $3x-10+2y=300$

$3x+2y=310$

$2y=310-3x$

$y=155-\frac{3}{2}x$

$A=xy=x\left(155-\frac{3}{2}x\right)$

$=-\frac{3}{2}x^2+155x$

domain: must have

$x\geq10$

$y=155-\frac{3}{2}x\geq0$

$155\geq\frac{3}{2}x$

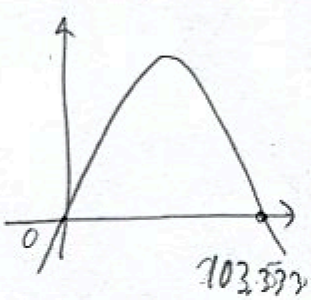
$x\leq\frac{2\cdot155}{3}$

$x\leq103.33333$

Domain

$[10,\ 103.33333]$

b)



max at

$x=-\frac{155}{2\cdot\left(-\frac{3}{2}\right)}=\frac{155}{3}$

$=51.66667$

$\text{area}=4004.166667$

Dimensions are:

51.666667×77.5 feet

$y=155-\frac{3}{2}\cdot\frac{155}{3}$