College Algebra — Joysheet 7
MAT 140, Spring 2018 — D. Ivanšić

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

1. (4pts) Solve the equation.

$|4x+5|=1$

$4x+5=1$ or $4x+5=-1$

$4x=-4$ $\quad 4x=-6$

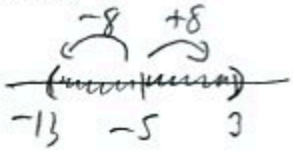
$x=-1$ or $x=-\frac{6}{4}=-\frac{3}{2}$

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

$|x+5|<8$

$|x-(-5)|<8$

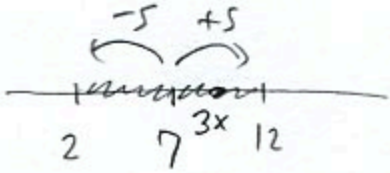
distance from x to -5 <8



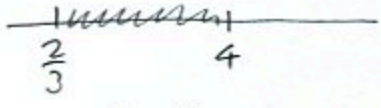
$(-13, 3)$

$|3x-7|<5$

distance from $3x$ to 7 <5



$\div 3$



$(\frac{2}{3}, 4)$

Solve the equations:

3. (8pts) $\frac{2x}{x+1}-\frac{3}{x+4}=\frac{x^2-7}{x^2+5x+4}$ $\quad | \cdot (x+1)(x+4)$

$(x+1)(x+4)$

$\frac{2x}{x+1}(x+1)(x+4)-\frac{3}{x+4}(x+1)(x+4)=\frac{x^2-7}{(x+1)(x+4)}(x+1)(x+4)$

$2x(x+4)-3(x+1)=x^2-7$

$2x^2+8x-3x-3=x^2-7 \quad | -x^2+7$

$x^2+5x+4=0$

$(x+1)(x+4)=0$

$x=-1,-4$ both give 0 in denominator, so

no solution

4. (8pts) $x+8=7+\sqrt{8x+28}$ $\quad | -7$

$x+1=\sqrt{8x+28} \quad | ^2$

$x^2+2\cdot x\cdot 1+1=8x+28 \quad | -8x-28$

$x^2-6x-27=0$

$(x-9)(x+3)=0$

$x=9,-3$

check: $x=9$

$9+8 \stackrel{?}{=} 7+\sqrt{72+28}$

$17 \stackrel{?}{=} 7+10$

yes

$x=-3$

$-3+8 \stackrel{?}{=} 7+\sqrt{-24+28}$

$-5 \stackrel{?}{=} 7+2$

no

$x=9$ is only sol.

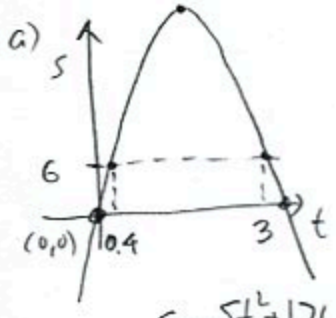
5. (14pts) Pig Pen throws a bar of soap upwards with initial velocity 17 meters per second. Its height in meters after t seconds is given by $s(t) = -5t^2 + 17t$.

a) Sketch the graph of the height function.

b) When does the soap reach its greatest height, and what is that height?

c) When is the soap at height 6 meters?

a)



$s = -5t^2 + 17t$

b) $h = -\frac{b}{2a} = -\frac{17}{2 \cdot 5} = 1.7$

$k = -5 \cdot 1.7^2 + 17 \cdot 1.7 = 14.45$

Greatest height of 14.45 m reached after 1.7 s.

c) $-5t^2 + 17t = 6$

Height of 6 m reached after 0.4 s and 3 s

$5t^2 - 17t + 6 = 0$

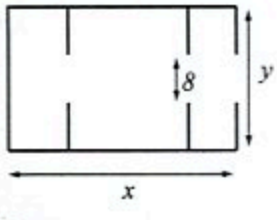
$289 - 120$

$t = \frac{-(-17) \pm \sqrt{(-17)^2 - 4 \cdot 5 \cdot 6}}{2 \cdot 5} = \frac{17 \pm \sqrt{169}}{10} = \frac{17 \pm 13}{10} = 3, \frac{2}{5} = 3, 0.4$

6. (14pts) Maxine is building a small gallery with three rooms that have doors 8 feet wide. She has budgeted for 1500 ft of walls and wishes to maximize the area of the gallery.

a) Express the total area of the gallery 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 gallery that has the greatest total area? What is the greatest total area possible?



a) $2x + y + 3(y - 8) = 1500$ $\quad A = x \cdot y$

$2x + 4y - 24 = 1500$

$4y = 1524 - 2x \quad | \div 4$

$y = 381 - \frac{1}{2}x$ substitute in A

$A = x\left(381 - \frac{1}{2}x\right)$

$= -\frac{1}{2}x^2 + 381x$

quadratic function

Domain:

must have

$x \geq 0$

$y \geq 8$

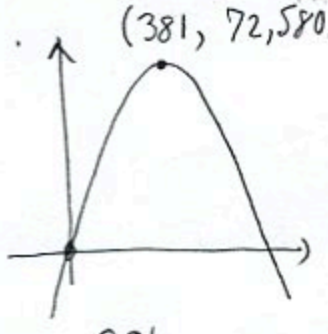
$381 - \frac{1}{2}x \geq 8$

$-\frac{1}{2}x \geq -373 \quad | \cdot (-2)$

$x \leq 746$

Domain: $[0, 746]$

b)



$h = -\frac{b}{2a} = -\frac{381}{2 \cdot (-\frac{1}{2})} = 381$

$k = -\frac{1}{2}381^2 + 381 \cdot 381 = 72,580.5$

Dimensions: 381×100.5 (not so small, after all)

Greatest area: $72,580.5 \text{ ft}^2$