College Algebra — Joysheet 7
MAT 140, Fall 2016 — D. Ivanšić

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

1. (4pts) Solve the equation.

$|4x+3|=5$

$4x+3=5$ or $4x+3=-5$

$4x=2$ $\quad 4x=-8$

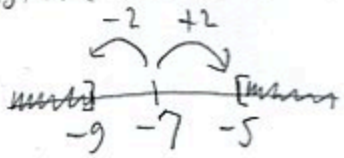
$x=\frac{1}{2}$ or $x=-2$

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

$|x+7|\geq 2$

$|x-(-7)|\geq 2$

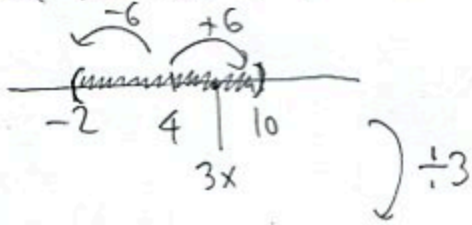
distance from x to $-7 \geq 2$

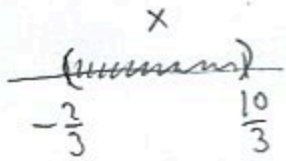


$(-\infty,-9]\cup[-5,\infty)$

$|3x-4|<6$

distance from $3x$ to $4 < 6$





$\left(-\frac{2}{3},\frac{10}{3}\right)$

Solve the equations:

3. (8pts) $\frac{x}{x-5}-\frac{30}{x^2-4x-5}=\frac{-4}{x+1}$ $\quad \cdot(x-5)(x+1)$

$(x-5)(x+1)$

$x(x+1)-30=-4(x-5)$

$x^2+x-30=-4x+20 \quad +4x-20$

$x^2+5x-50=0$

$(x+10)(x-5)=0$

$x=-10, 5$ gives 0 in denom. of original eq.

$x=-10$

4. (8pts) $2x+3=x+\sqrt{3x+37}$ $\quad -x$

$x+3=\sqrt{3x+37} \quad ()^2$

$x^2+2\cdot x\cdot 3+3^2=3x+37 \quad -3x-37$

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

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

$x=-7, 4$

Check: $-14+3=-7+\sqrt{-21+37}$ (16)

$-11=-7+4$ not true

$8+3=4+\sqrt{12+37}$ (49)

$11=4+7$ true

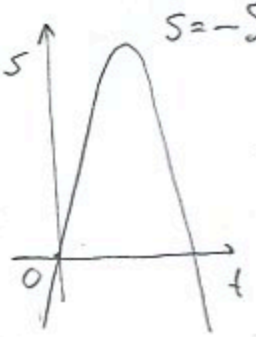
5. (14pts) A ball is thrown upwards from the ground with initial velocity 17 meters per second. Its height in meters after t seconds is given by $s(t) = -5t^2 + 17t$.

a) Sketch the graph of the height function.

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

c) When is the ball at height 12 meters?

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



b) vertex: $h = -\frac{b}{2a} = -\frac{17}{2(-5)} = \frac{17}{10} = 1.7$

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

Max height of 14.45 reached after 1.7 seconds

c) $-5t^2 + 17t = 12$ Height 12 reached at time $t = 2.4s, 1s$

$5t^2 - 17t + 12 = 0$

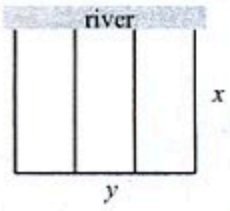
$$t = \frac{-(-17) \pm \sqrt{(-17)^2 - 4 \cdot 5 \cdot 12}}{2 \cdot 5} = \frac{17 \pm \sqrt{49}}{10} = \frac{17 \pm 7}{10} = \frac{24}{10}, \frac{10}{10}$$

$= 2.4, 1$

6. (14pts) A farm is fencing in a rectangular area along a river and dividing it in three sections (see picture). The part along the river is not fenced. The farm budgeted for 10,000 feet of fence, and its goal is to maximize the total enclosed area.

a) Express the total area of the fenced-in field 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 fenced-in field that has the greatest total area and what is the greatest total area possible?



a) $4x + y = 10000$

$y = 10000 - 4x$

$A = xy = x(10000 - 4x)$

$= -4x^2 + 10000x$

Domain:

$x \geq 0$

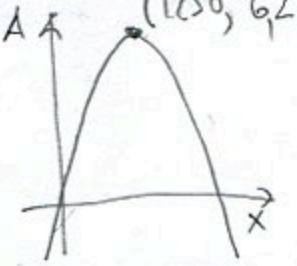
$y \geq 0$

$10{,}000 - 4x \geq 0$

$4x \leq 10000$

$x \leq 2500$

b)



(1250, 6,250,000)

$x = 1250$

$y = 10000 - 4 \cdot 1250 = 5000$

$h = -\frac{b}{2a} = -\frac{10000}{2(-4)} = 1250$

$k = -4 \cdot 1250^2 + 10000 \cdot 1250 = 6{,}250{,}000$

Dimensions: 1250×5000

Max area: $6{,}250{,}000\ ft^2$