College Algebra — Joysheet 9
MAT 140, Fall 2014 — D. Ivanšić

Name: Soul Ocean

Show all your work!

1. (4pts) Solve the equation.

$|3x-7| = 11$

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

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

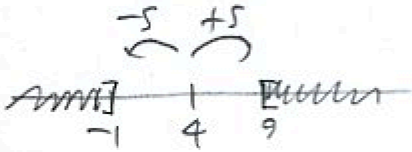
$x=6$ $\quad$ $x=\frac{4}{3}$

sol: $6, \frac{4}{3}$

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

$|x-4| \geq 5$

dist. from x to $4 \geq 5$

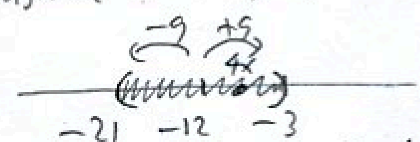


$(-\infty,-1] \cup [9,\infty)$

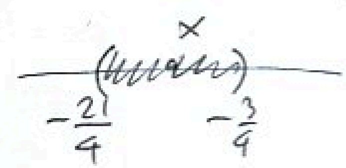
$|4x+12| < 9$

$|4x-(-12)| < 9$

distance from $4x$ to $-12 < 9$



divide by 4



$\left(-\frac{21}{4}, -\frac{3}{4}\right)$

Solve the equations:

3. (8pts) $\dfrac{2x}{x-5} + \dfrac{7}{x-1} = \dfrac{x^2+3x}{x^2-6x+5}$ $\Big|\cdot(x-1)(x-5)$

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

$2x(x-1)+7(x-5) = x^2+3x$

$2x^2-2x+7x-35 = x^2+3x$ $\Big| -x^2 -3x$

$x^2+2x-35=0$

$(x-5)(x+7)=0$

$x=5$ or $\boxed{x=-7}$

gives 0 in denom. $\quad$ solution

4. (8pts) $\sqrt{33-x} - \sqrt{40-3x} - 1 = 0$

$\sqrt{33-x} = \sqrt{40-3x} + 1$ $\Big|^2$

$33-x = 40-3x+2\sqrt{40-3x}+1$ $\Big| -41 +3x$

$2x-8 = 2\sqrt{40-3x}$ $\Big| \div 2$

$x-4 = \sqrt{40-3x}$ $\Big|^2$

$x^2-8x+16 = 40-3x$ $\Big| +3x-40$

$x^2-5x-24=0$

$(x-8)(x+3)=0$

$x=8,-3$

Check:

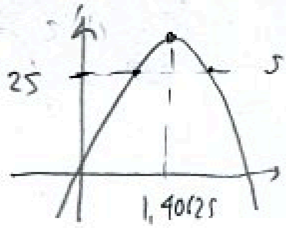
$x=8$: $\sqrt{25}-\sqrt{16}-1 \stackrel{?}{=} 0$ yes

$x=-3$: $\sqrt{36}-\sqrt{49}-1 \stackrel{?}{=} 0$ no

$\boxed{x=8}$ is the solution

5. (14pts) A ball is thrown upwards from the ground with initial velocity 45 ft/sec.
a) Write the function that describes the height of the ball in feet t seconds after release.
b) When does the ball reach its greatest height, and what is that height?
c) When is the ball at height 25 feet?

a) $s(t) = -16t^2 + 45t$



b) vertex of $s(t) = -16t^2 + 45t$ is

$h = -\frac{45}{2\cdot(-16)} = \frac{45}{32} = 1.40625$

$k = -16\cdot\left(\frac{45}{32}\right)^2 + 45\cdot\frac{45}{32} = 31.640625$

Reaches max height of 31.640625 ft after 1.40625 seconds

c) $-16t^2 + 45t = 25$

$16t^2 - 45t + 25 = 0$

$t = \frac{-(-45) \pm \sqrt{(-45)^2 - 4\cdot16\cdot25}}{2\cdot16}$

$25\cdot17$

$= \frac{45 \pm \sqrt{425}}{32} = \frac{45 \pm 5\sqrt{17}}{32}$

$= 2.050485$ on way down

0.762015 on way up

6. (14pts) A small orchard has ripening pears. At the start of the selling season, 180 pounds of pears were picked and in storage. Every day after that, 30 pounds of pears are picked and added to storage. Suppose the value of a pound of pears is \$4 at the start and decreases 10 cents per day after that.
a) Express the value of all the pears in storage as a function of the number of days x since the start of the selling season. What is the domain of this function?
b) Sketch the graph of the function in order to find the maximum (no need for the graphing calculator — you should already know what the graph looks like). How many days after the start of the selling season is the value of the pears in storage maximal and what is this value?

a) Value of pears = (pounds in storage)(price per pound)

$= (180 + 30x)(4 - 0.10x)$

$= 720 + 120x - 18x - 3x^2$

$v(x) = -3x^2 + 102x + 720$

domain: $x \geq 0$ price ≥ 0

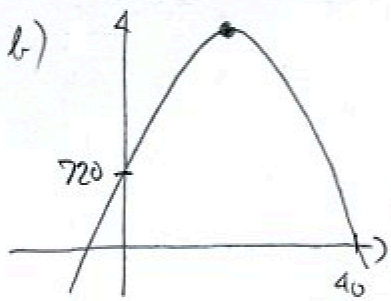
$4 - 0.1x \geq 0$

$0.1x \leq 4$

$x \leq 40$

$[0, 40]$

b)



vertex:

$h = -\frac{102}{2\cdot(-3)} = 17$

$k = -3\cdot17^2 + 102\cdot17 + 720$

$= 1587$

Max. value of stored pears is \$1587, occurs 17 days after start of selling season.