College Algebra — Joysheet 9 **MAT 140, Spring 2026 — D. Ivanšić**	Name: Saul Ocean *Covers: 3.3, 3.4, 3.5 Show all your work!*

1. (4pts) Solve the equation.

$|3x+4| = 8$

$3x+4=8$ or $3x+4=-8$

$3x=4$ $\quad$ $3x=-12$

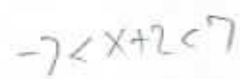
$x=\frac{4}{3}$ $\quad$ $x=-4$

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

$|x+2| < 7$

$-7 < x+2 < 7$

$-9 < x < 5$



$(-9, 5)$

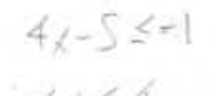
$|4x-5| \geq 1$

$4x-5 \geq 1$ or $4x-5 \leq -1$

$4x \geq 6$ $\quad$ $4x \leq 4$

$x \geq \frac{6}{4}$ $\quad$ $x \leq 1$

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



$(-\infty, 1] \cup [\frac{3}{2}, \infty)$

Solve the equations:

3. (8pts) $\dfrac{x}{x+3} - \dfrac{2x-3}{x-5} = \dfrac{3x+33}{x^2-2x-15}$ $\quad \Big| \cdot (x+3)(x-5)$

$(x+3)(x-5)$

$\dfrac{x}{\cancel{x+3}}(\cancel{x+3})(x-5) - \dfrac{2x-3}{\cancel{x-5}}(x+3)(\cancel{x-5}) = \dfrac{3x+33}{\cancel{(x+3)(x-5)}}\cancel{(x+3)(x-5)}$

$x(x-5) - (2x-3)(x+3) = 3x+33$

$x^2-5x-(2x^2+3x-9) = 3x+33$

$-x^2-8x+9 = 3x+33 \quad |-3x-33$

$-x^2-11x-24=0$

$x^2+11x+24=0$

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

$x=-3$ or $x=-8$

↑ gives 0 in denom

Only $x=-8$ is a solution

4. (8pts) $x = 2 - \sqrt{16-8x}$ $\quad |-2$

$x-2 = -\sqrt{16-8x}$ $\quad |^2$

$(x-2)^2 = \left(-\sqrt{16-8x}\right)^2$

$x^2-4x+4 = 16-8x$ $\quad |+8x-16$

$x^2+4x-12=0$

$(x+6)(x-2)=0$

$x=-6$ or $x=2$ ← both are solutions

Check $-6 \stackrel{?}{=} 2-\sqrt{16-8(-6)}$ $\quad$ $2 = 2-\sqrt{16-8\cdot 2}$

$-6 \stackrel{?}{=} 2-\sqrt{64}$ yes $\quad$ $2=2-\sqrt{0}$ yes

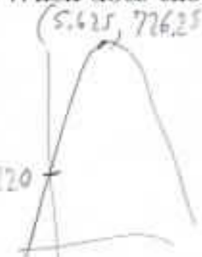
5. (14pts) A model rocket is launched. When its engine cuts off, it is at height 220 feet heading upwards with velocity 180 feet per second. Its height in feet after t seconds is given by $s(t) = -16t^2 + 180t + 220$.

a) Sketch the graph of the height function.

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

c) When does the rocket fall to the ground?

a)



b) $h = -\frac{b}{2a} = -\frac{180}{2\cdot(-16)} = \frac{180}{32} = \frac{45}{8} = 5.625$ seconds

$k = -16\left(\frac{45}{8}\right)^2 + 180\cdot\frac{45}{8} + 220 = -16\cdot\frac{2025}{64} + \frac{2025}{2} + 220$

$= \frac{-2025+4050}{4} + \frac{880}{4} = \frac{2025+880}{4} = \frac{2905}{4} = 726\frac{1}{4} = 726.25$ ft

Greatest height of 726.25 feet reached after 5.625 seconds

c) $-16t^2+180t+220=0 \quad |\div 4$

$-4t^2+45t+55=0$

$4t^2-45t-55=0$

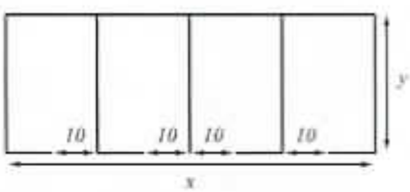
$t = \frac{-(-45)\pm\sqrt{(-45)^2+4\cdot4\cdot55}}{2\cdot4} = \frac{45\pm\sqrt{2905}}{8} = 12.362256,\ -1.112256 \leftarrow$ not a sol, $t>0$

Falls to ground after 12.362256 seconds

6. (14pts) Developer Simon is planning a building to house four stores, each with a 10-foot entrance at the front (see picture). He has budgeted for total wall length 800 feet and his goal is to maximize the total 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?

c) 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 total area and what is the greatest area possible?



$2x-40+5y=800$

$2x=840-5y$

$x=420-\frac{5}{2}y$

$A = xy = \left(420-\frac{5}{2}y\right)y$

$A(y) = -\frac{5}{2}y^2+420y$

$h = -\frac{b}{2a} = -\frac{420}{2\cdot\left(-\frac{5}{2}\right)} = \frac{420}{5} = 84$

$k = -\frac{5}{2}\cdot 84^2 + 420\cdot 84 = 17640$

$420-\frac{5}{2}\cdot 84 = 420-5\cdot 42$

Dimensions: 210 × 84 ft

Max area: 17,640 ft^2

Domain:

must have $y\ge 0$

$x \ge 40$

$420-\frac{5}{2}y \ge 40$

$\frac{5}{2}y \le 380 \quad |\cdot\frac{2}{5}$

$y \le 152$

Domain: $[0, 152]$