Unit 4 Group Work Practice
PCHA 2021-22 / Dr. Kessner

No calculator! Have fun!

1. Let

$$f(x) = \begin{cases} x & \text{if } x < 0 \\ 2 - (x-1)^2 & \text{if } x \geq 0 \end{cases}$$

a) Sketch the graph of $f(x)$.

b) On what intervals is f increasing and/or decreasing? Is f bounded? Does it have any local or global maxima or minima?

c) Does f have any discontinuities? Where, and what type?

d) Describe the end behavior of f using limits.

2. Consider the same function from the previous problem.

$$f(x) = \begin{cases} x & \text{if } x < 0 \\ -(x-1)^2 & \text{if } x \geq 0 \end{cases}$$

Sketch the graphs of the following transformed functions:

- $p(x) = f(-x)$
- $q(x) = f(|x|)$
- $r(x) = |f(|x|)|$
- $s(x) = |f(-x)|$
- $t(x) = -f(-|x|)$

3. Factor the following polynomial completely, both over $\mathbb{R}$ (as a product of real linear and irreducible quadratic factors) and over $\mathbb{C}$ (as a product of complex linear factors). Sketch the graph of the function.

$$p(x) = -2x^3 + 7x^2 + 17x - 10$$

4. Factor the following polynomial completely, both over $\mathbb{R}$ (as a product of real linear and irreducible quadratic factors) and over $\mathbb{C}$ (as a product of complex linear factors). Sketch the graph of the function. A little bird tells you that $2 + 3i$ is a zero.

$$q(x) = x^4 - 4x^3 + 10x^2 + 12x - 39$$

5. Sketch the graph of the following rational function:

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