

Johns Hopkins University, Department of Mathematics

110.105 Intro to Calculus - Fall 2013

Midterm 1

Instructions: This exam has 9 pages and is out of a total of 100 points. No calculators, books or notes allowed. Be sure to show all work for all problems. No credit will be given for answers without work shown. If you do not have enough room in the space provided you may use additional paper. Be sure to clearly label each problem and attach them to the exam. You have 50 MINUTES.

Academic Honesty Certification

I certify that I have taken this exam with out the aid of unauthorized people or objects.

Signature: _____ Date: _____

Name: _____

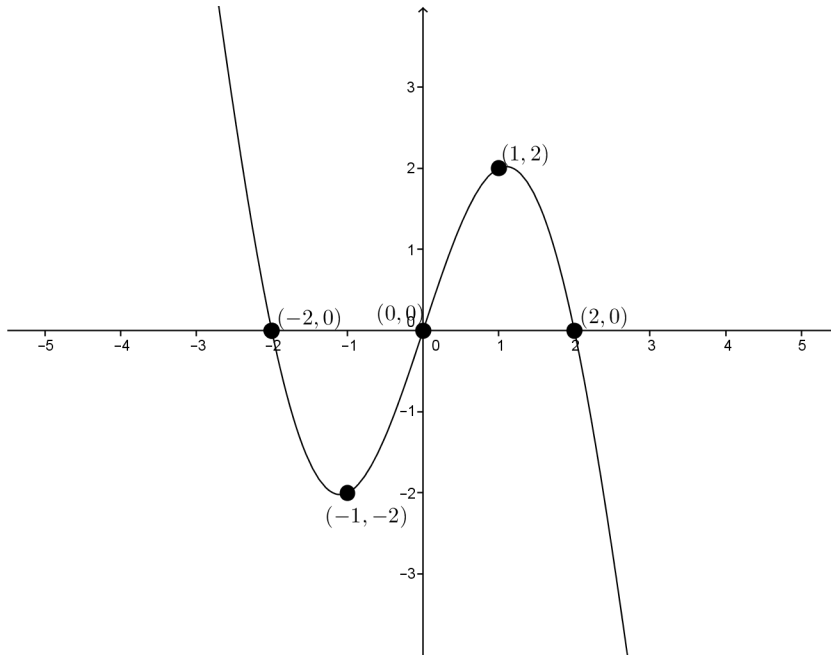
1. (15 total points) Consider the function given by

$$f(x) = \sqrt{x+1}$$

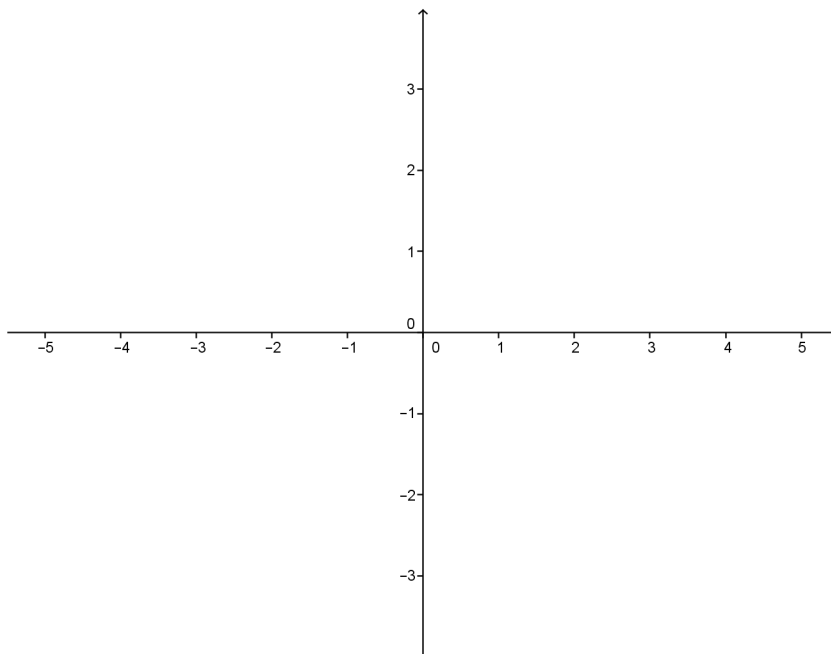
- (a) (5 points) Find the domain and range of this function.

- (b) (10 points) Find the inverse function and state its domain.

2. (15 points) The graph of a function $f(x)$ is shown below.



Use this information to graph $y = f(x - 1) + 1$. Be sure to show where the labeled points go under this transformation.



3. (15 total points) Consider the quadratic function

$$f(x) = -2x^2 - 4x - 5$$

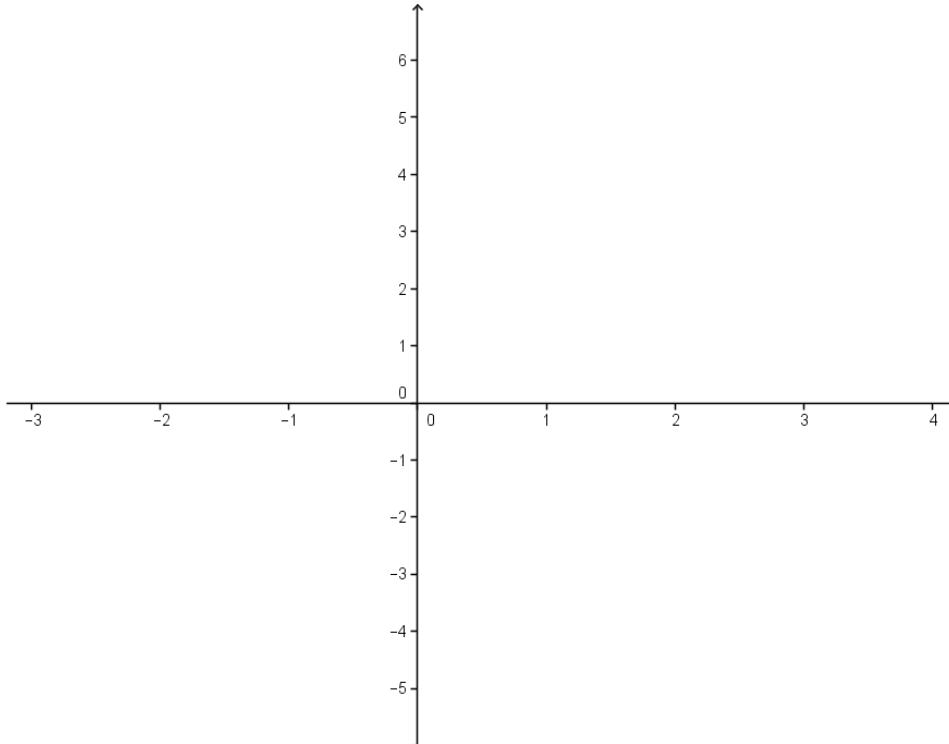
(a) (7 points) Rewrite this quadratic in the form $f(x) = a(x - h)^2 + k$

(b) (8 points) Find the vertex and x and y intercepts.

4. (20 points) Graph the polynomial given by

$$f(x) = x^3 - 3x^2 + 4$$

Be sure to plot the x and y intercepts and think about the behavior of the graph at x -intercepts and its behavior as x goes to ∞ and $-\infty$.



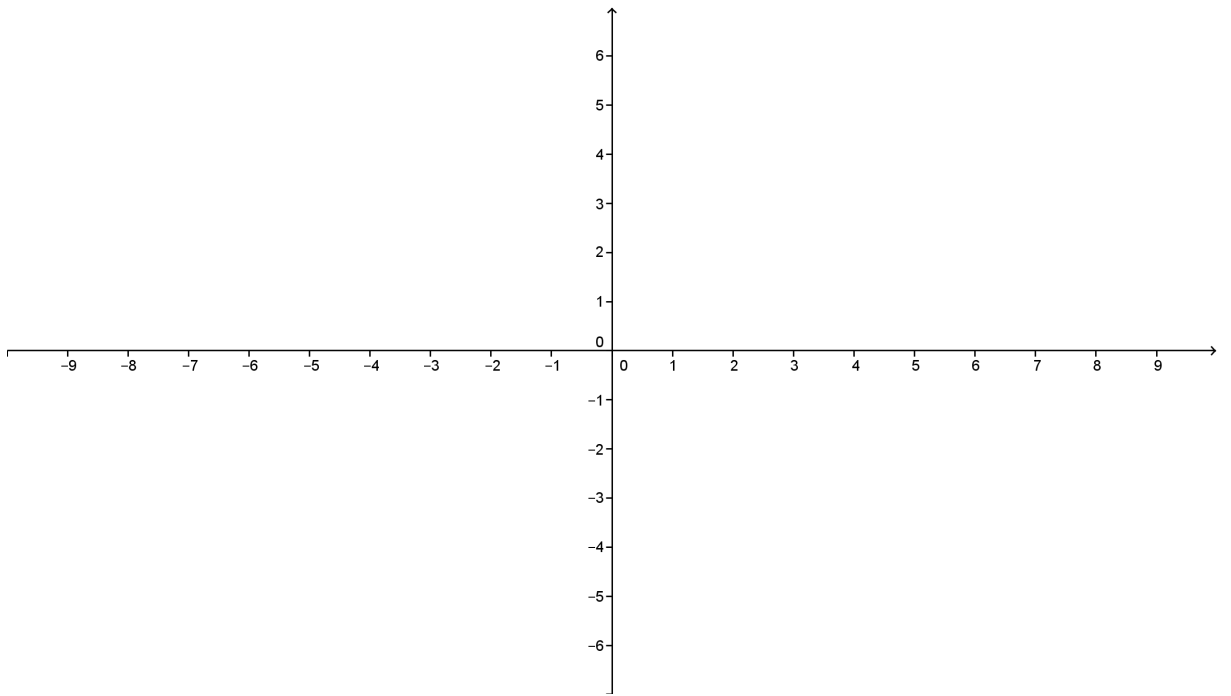
5. (20 total points) Consider the rational function given by

$$f(x) = \frac{x - 4}{x^2 - x - 6}$$

(a) (7 points) Find the vertical and horizontal asymptotes of this function.

(b) (6 points) Find all x and y intercepts.

- (c) (7 points) Graph the rational function below. Be sure to plot all asymptotes and x and y intercepts.
(You may find the following values of f useful: $f(3.5) \approx -0.18$, $f(5) \approx 0.07$, $f(-3) \approx -1.17$)



6. (15 total points) Solve each of the following equations/inequalities.

(a) (7 points) $x^4 - 2x^2 - 3 = 0$ (*Be sure to find all real and complex (imaginary) solutions*)

(b) (8 points) $x^2 + 4x \leq -3$

Extra paper!