

Instructions. (100 points) Use proper mathematical notation, sound writing, and good organization to provide solutions to each of the following exercises in the space provided. Place all of your work on your own paper. When finished, arrange your papers in order, then staple this exam on top. Calculators are **not** allowed on this examination.

- (10^{pts}) 1. Solve the following equation for x .

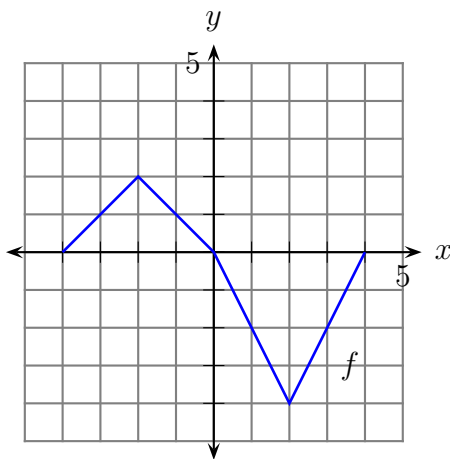
$$2x^{2/5} + 3x^{1/5} - 2 = 0$$

- (10^{pts}) 2. Given the function $f(x) = 3x^2 + 4x - 5$, find the average rate of change of f from 1 to x , and simplify your answer. State any restrictions.

- (10^{pts}) 3. Solve the following inequality for x .

$$\left| x - \frac{2x - 3}{5} \right| < 4$$

- (10^{pts}) 4. Given the graph of f below, sketch the graph of $y = (1/2)f(-x) + 1$.



- (10^{pts}) 5. Consider the quadratic function $f(x) = x^2 + 6x - 7$. Perform each of the following tasks.
- (a) Put the equation in vertex form by completing the square. Plot the vertex and label it with its coordinates. Plot the axis of symmetry and label it with its equation.
 - (b) Use an algebraic approach to find the x -intercepts of the function. Plot the x -intercepts and label them with their coordinates. Plot the y -intercept and label it with its coordinates.
 - (c) Sketch the graph of f , then shade the solution of $f(x) > 0$ on the x -axis. Use interval notation to describe this solution set.

(10^{pts}) **6.** Consider the polynomial $p(x) = (x + 3)^2(x + 1)^3(x - 4)$. Perform each of the following tasks.

(a) Sketch the graph of the polynomial. *Note: Do not scale the y-axis. Scale the x-axis. I am only concerned that you get the x-intercepts and behavior near the x-intercepts correct, as well as the end-behavior of the polynomial.*

(b) Shade the solution of $p(x) \geq 0$ on the x-axis of your graph. Use interval notation to describe this solution set.

(10^{pts}) **7.** Consider the rational function

$$f(x) = \frac{x^2 - 16}{x + 1}.$$

Perform each of the following tasks.

(a) Sketch the graph of the rational function. Label x-intercepts with their coordinates. Show all supporting work for asymptote detection. Sketch the asymptote(s) and label them with their equation(s).

(b) Shade the solution of $f(x) \leq 0$ on the x-axis of your graph. Use interval notation to describe this solution set.

(10^{pts}) **8.** Consider the rational function

$$f(x) = \frac{2x^2 - x - 28}{x - 4}.$$

Sketch the graph of f . Label all essential information.

(10^{pts}) **9.** Given that $x = -1$ is a root of $p(x) = 2x^3 - 3x^2 - 17x - 12$, calculate all roots of the polynomial $p(x)$.

(10^{pts}) **10.** Given that $x = -2$ is a root of $p(x) = x^3 - 2x^2 - 3x + 10$, calculate all roots of the polynomial $p(x)$.