

Please work together, however students must hand in their own lab. **Remember to show any work, NEATLY, and in PENCIL, please 😊, so to that end you may want to do your scratch work on a separate paper, transfer neat work to this, and staple your scratch to this. Make sure you number your scratch problems. Points are deducted for illegible work. (100 pts)**

(24 pts) The path of a baseball can be described by the following function:

$Height = h(x) = -0.005x^2 + 2x + 3.5$ where $h(x)$ is the height of the ball (in feet) when the ball is directly above a point that is x feet from home plate. Feel free to use your graphing calculator to help answer this problem. What quadrant(s) should you show the graph in?

a. Show a quick sketch of the graph here:

b. Window size used: x 's: [,]; y 's: [,]

c. What was the maximum height that the ball reaches?

d. The center field fence is 20 feet high and 390 feet away from home plate. Will the ball clear the fence? Show mathematical reasoning why/why not.

e. How far (horizontally) would the ball travel from home plate in the air if there were no fence or grandstand to obstruct its flight? Round to the nearest whole foot.

f. How high was the ball when it went over the center fielder's head 375 feet from home plate?

2. Let $f(x) = -\sqrt{25 - x^2}$. Use your calculator to graph the function. Carefully sketch the graph here:

- a. Find the domain and range for the function. State using interval notation. (6 pts)

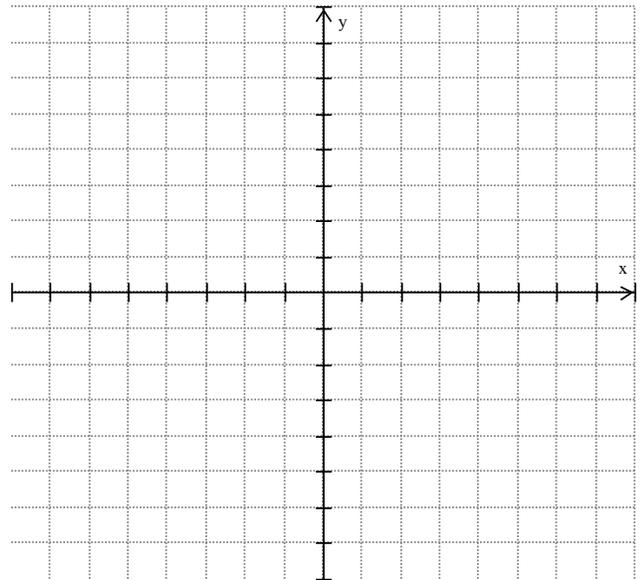
Domain:

Range:

- b. Find where $f(x)$ is increasing and decreasing. Use interval notation. (6 pts)

increasing:

decreasing:



3. Let $f(x) = x^3 - 4x^2 + x + 3$. Use your calculator to help you graph the function here. Use your TABLE feature to plot at least 5 points. Label units on each axis. (4 pts)

Round the following to 2 decimal places.

- a. Find the local min and local max *values* for $f(x)$. (6 pts)

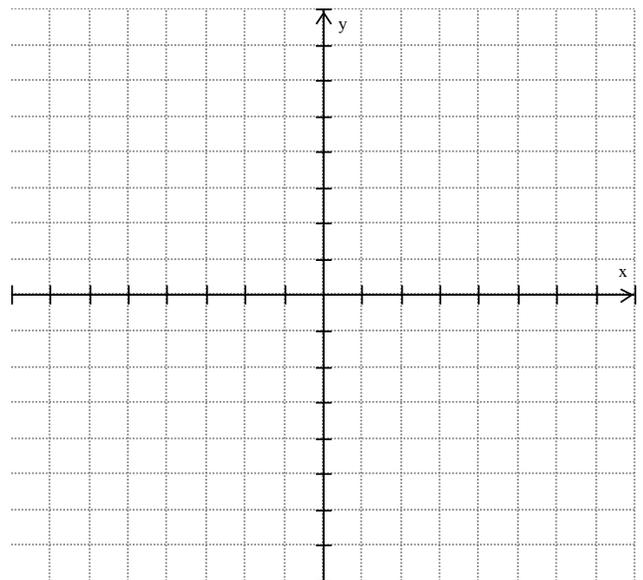
local min:

local max:

- b. Find where $f(x)$ is increasing and decreasing. (6 pts)

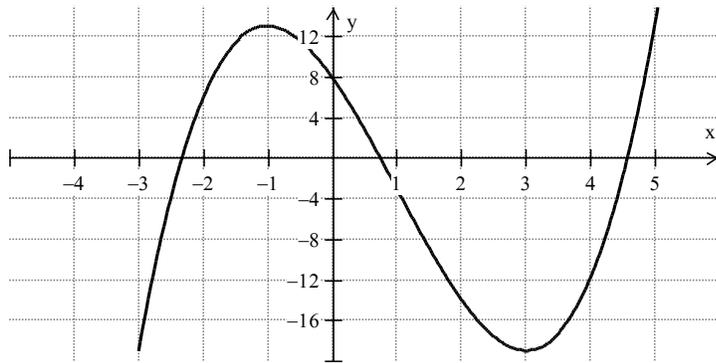
increasing:

decreasing:



- c. Find the average rate of change from $x = 1$ to $x = 3$ Show work. (6 pt)

4. Consider the function $f(x) = x^3 - 3x^2 - 9x + 8$. It is graphed below. (12 pts)



- a. Give the ordered pairs that represent the location of the local minimum and maximum. (Estimate values as accurately as possible from the graph) (4 pts)

location of local minimum:

location of local maximum:

- b. On what interval(s) is $f(x)$ decreasing? (4 pt)

- c. Find the average rate of change from $x = -2$ to $x = 4$. Show your work. (4 pt)

5. Let $f(x) = x^2 - 5x + 6$ Find the average rate of change from $x = a$ to $x = a + h$. Simplify and show your work. (12 pts)

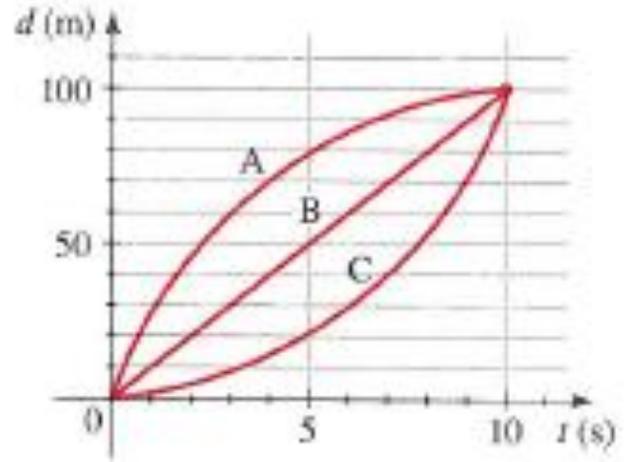
6. A 100-meter race ends in a three-way tie for first place for runners A, B, and C. The graph shows the distance in meters they each ran as a function of time, in seconds, for each of the three winners.

a. Find the average speed throughout the race for each winner. Don't forget to use appropriate units. (9 pts)

A:

B:

C:



b. In this space, describe in 3 short statements how each of the three runners ran the race, as compared to the others. Hint: Think about their speed at different points in the race. (9 pts)

BONUS! (6 points) Let $g(x) = \frac{2}{x+1}$ Find the average rate of change from $x = 3$ to $x = 3 + h$. Simplify and show your work: