Math-19 Exam #3

Name: _____

This exam is closed book and notes. You may use a calculator and both sides of a 3×5 note card; however, no cell phones or tablets are allowed. Show all work; there is no credit for guessed answers. All values should be exact with no decimals unless you are specifically asked for an approximate or decimal answer.

1). A certain chemical reaction produces product at a rate of 5 g/s. After 1 minute, 425 g of product is produced. Let $p(t)$ be the amount of product after t seconds and let $p(0)$ be the amount of product at $t = 0$.

   a). Construct a linear model for this reaction.

   b). Find $p(0)$.

2). Consider $x^2 + y^2 = 4$. Answer true or false?

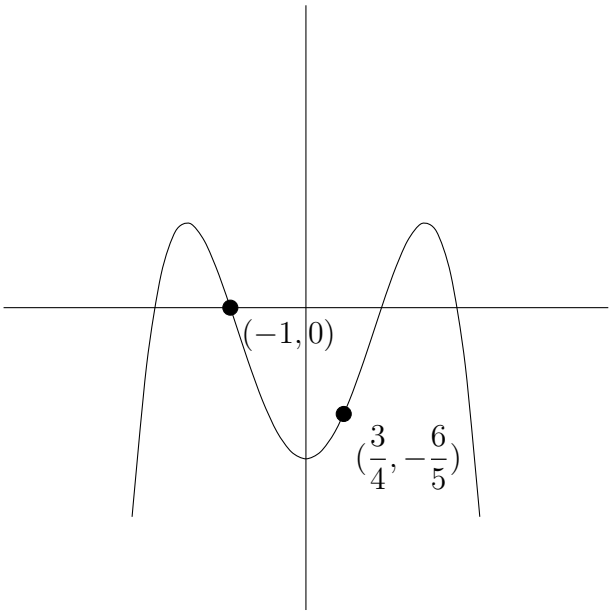
   a). This is an example of a function.

   b). This is an example of a relation.

3). Calculate the difference quotient for $f(x) = \dfrac{1}{x}$.

4). Let $h(x) = \sqrt{x+1} - x - 1$. Find an $f(x)$ and a $g(x)$ such that $h(x) = (f \circ g)(x)$ with the constraint that neither $f(x) = x$ nor $g(x) = x$.

5). Consider the following graph of a polynomial $p(x)$:



a). Solve for x: $p(x) = -\frac{6}{5}$

b). What is the remainder when the polynomial is divided by $\left(x - \frac{3}{4}\right)$?

c). What is the remainder when the polynomial is divided by $(x + 1)$?

d). List two equivalent statements to the fact that $(-1, 0)$ is a point in the graph of $p(x)$.

i.

ii.

6). Let $f(x) = 3 - 2\sqrt{x+1}$.

a). List the starting function and the three transformations in the order that they should be applied:

i.

ii.

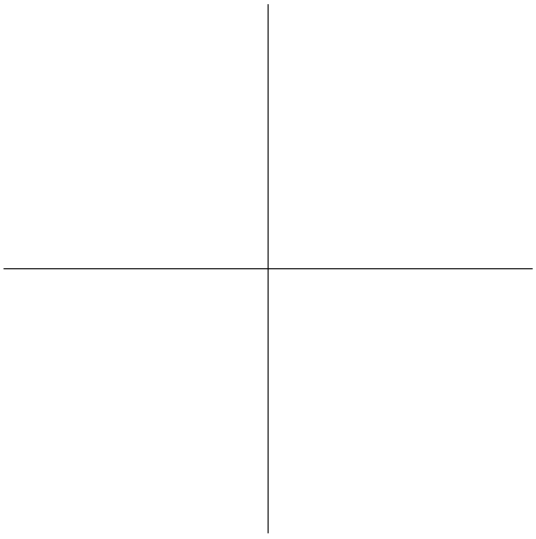
iii.

iv.

b). What are the x intercepts (if any)?

c). What are the y intercepts (if any)?

d). Sketch the graph. Be sure to label *all* key points.



7). Consider the parabola: $y = 1 - 3x + 2x^2$.

a). Convert the general form to standard form by completing the square.

b). What are the coordinates of the vertex?

c). What are the x intercepts (if any)?

d). What are the y intercepts (if any)?

e). Where is the function increasing (in interval notation)?

f). Where is the function decreasing (in interval notation)?

g). What is the domain (in interval notation)?

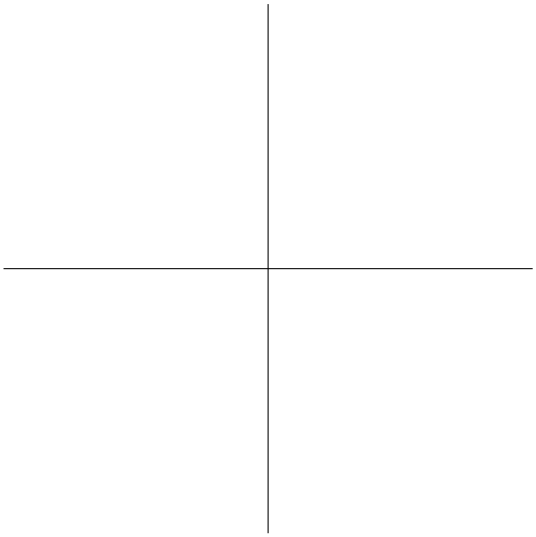
h). What is the range (in interval notation)?

i). Where are the local maxima (if any)?

j). Where are the local minima (if any)?

k). Where is the axis of symmetry?

l). Sketch the graph. Be sure to label *all* key points.



8). A child throws a ball up with an initial velocity of 32 ft/s. When the ball leaves the child's hand it is already 4 ft in the air. How high does the ball go before it stops and comes back down?

9). Consider the polynomial $p(x) = 2x^3 - 7x^2 + 4x + 4$

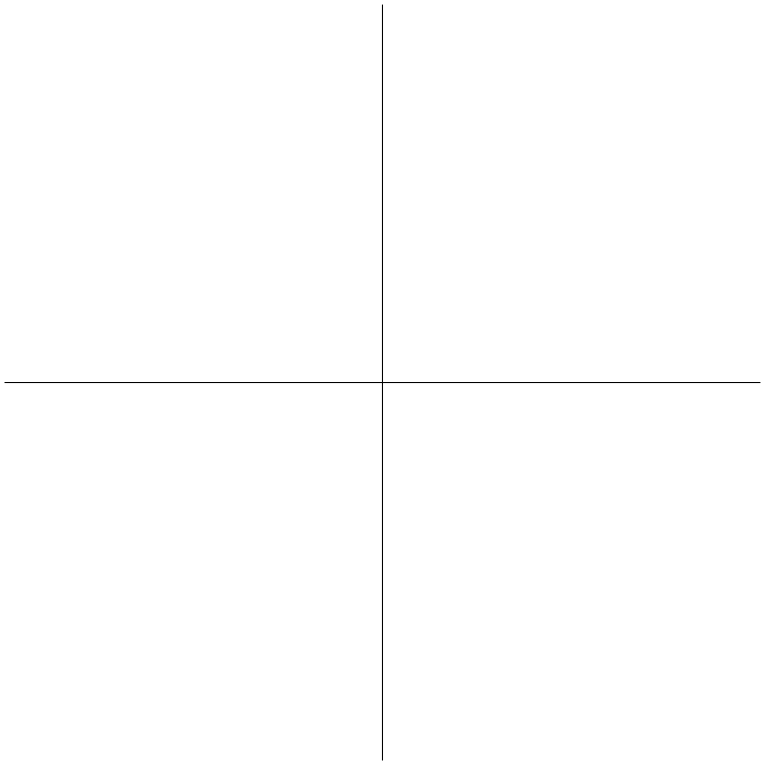
a). List all of the possible candidates for real zeros of the polynomial.

b). Completely factor $p(x)$. How you select candidates and pull out linear factors should be clear for full credit.

c). What are the x intercepts (if any)?

d). What are the y intercepts (if any)?

e). Sketch the graph.



10). Consider the rational function $r(x) = \dfrac{x^2 + x - 2}{(x^2 - 9)^2}$.

a). What are the zeros?

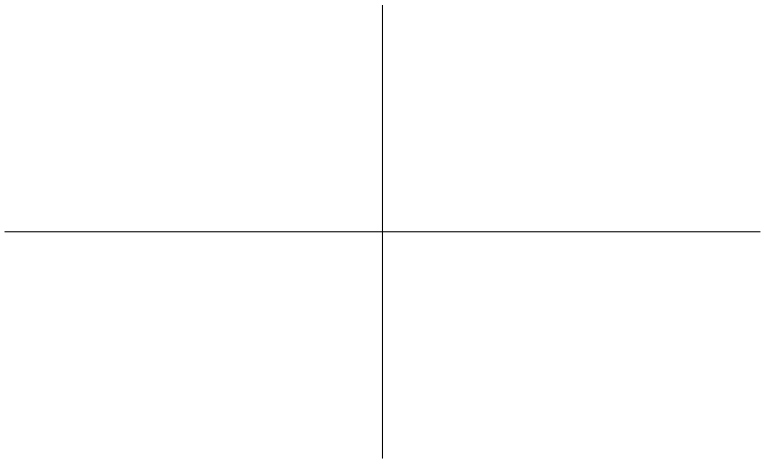
b). What are the poles?

c). What are the y-intercepts (if any)?

d). Where is the horizontal asymptote?

e). Where are the vertical asymptotes?

f). Sketch the graph. Be sure to label all intercepts and show all asymptotes.



g). The graph has one local extrema. Use your calculator to locate it and indicate whether it is a minimum or a maximum.