Math-19 Final Exam

Name: _____

This exam is closed book and notes except for the provided trig cheat sheet and your 3×5 note card (both sides). You may use a calculator; 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. Be careful to check for extraneous solutions.

problem	score
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
TOTAL	

1). Simplify completely. You may assume that all variable values are positive.

$$\frac{8x^{\frac{1}{2}}y^{-3}}{2x^{-2}s^4}$$

2). Solve for x:

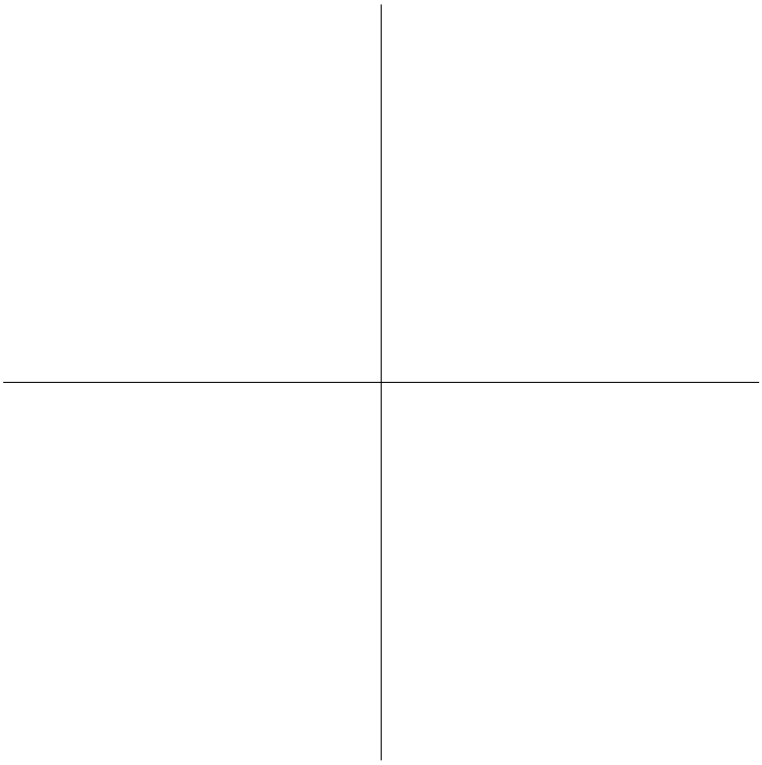
$$\frac{1}{x} + \frac{2}{x-1} = 3$$

3). Consider the following conic section in general form:

$$x^2 + y^2 - 6x - 10y + 34 = 0$$

a). Convert to standard form.

b). Sketch its graph. Be sure to label all important parts of the sketch.



4). The maximum range of a projectile is directly proportional to the square of its velocity. A baseball pitcher throws a ball at 60 mph, with a maximum range of 242 ft. What is his maximum range if he throws the ball at 70 mph?

5). Calculate the difference quotient for $f(x) = x^2 + 3x$

6). Consider the function $h(x) = \sqrt{x-1} + (x-1)^2 - 2$. Determine two functions $f(x)$ and $g(x)$ such that $h = f \circ g$.

7). Consider the following function:

$$f(x) = -2\,|x - 1| + 3$$

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

i.

ii.

iii.

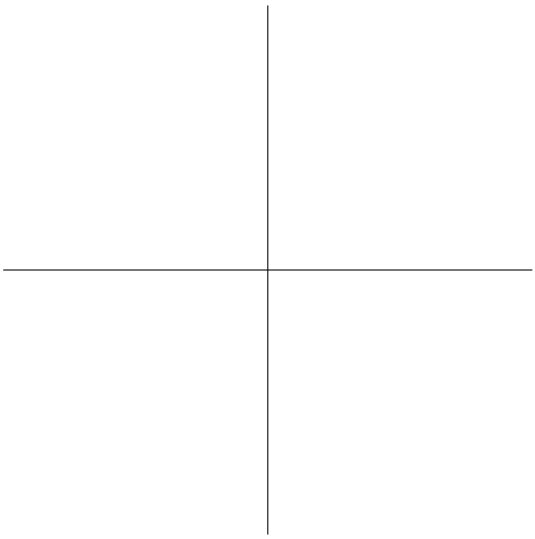
iv.

v.

b). Determine the x-intercepts (if any).

c). Determine the y-intercepts (if any).

d). Sketch the graph. Be sure to label all important parts.



8). Consider the following parabola in general form:

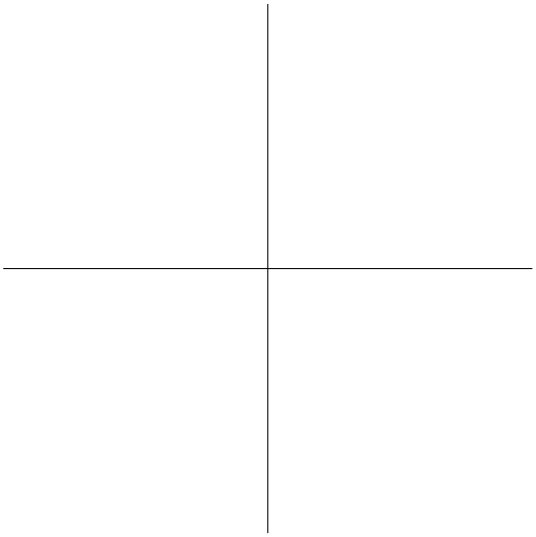
$$y = 2x^2 - 8x + 4$$

a). Convert to standard form.

b). Determine the x-intercepts (if any).

c). Determine the y-intercepts (if any).

d). Sketch the graph. Be sure to label all important parts.

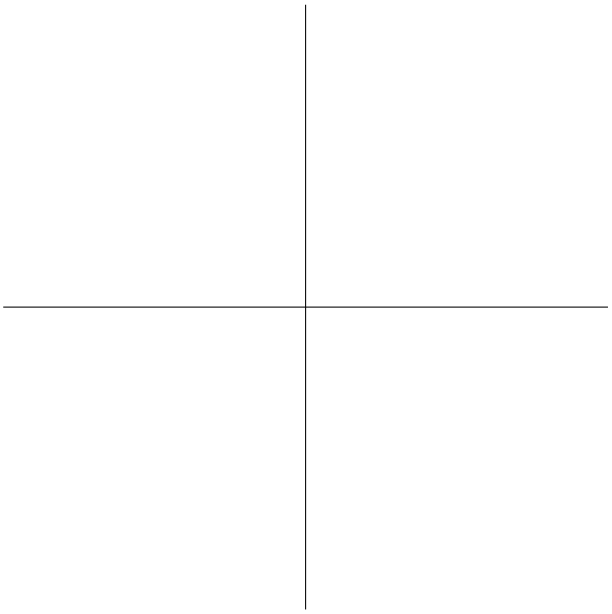


9). Consider the following polynomial function:

$$y = x^4 - 3x^3 + 2x$$

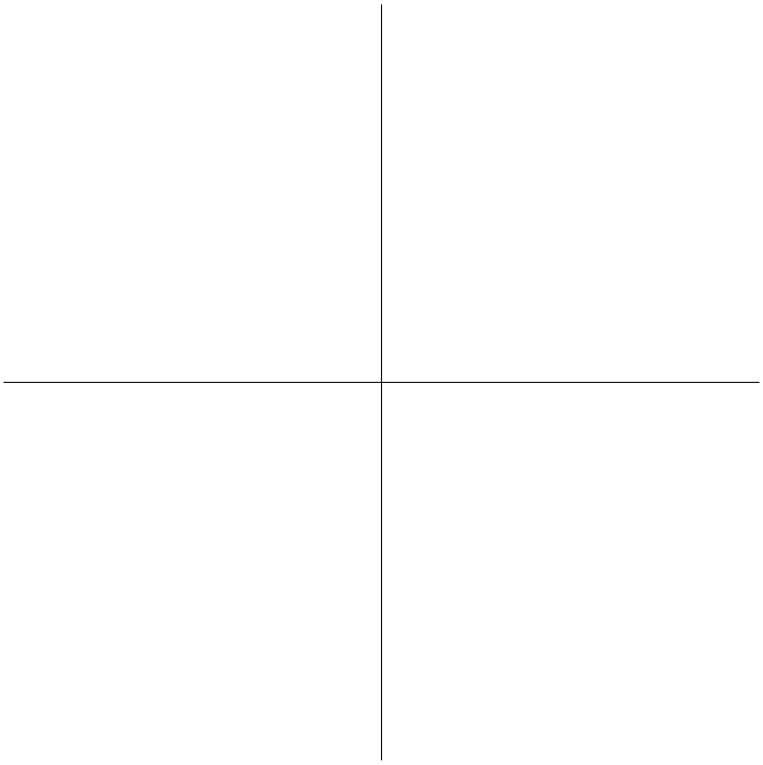
a). Factor completely. For full credit you must show how you construct candidate zeros, how you determine which candidates are actual zeros, and then how you factor out the identified zeros.

b). Sketch the polynomial. Be sure to show the proper end behavior, label all zeros, and determine all extrema using your calculator.



10). Sketch the following rational function. Be sure to show the proper end behavior and label all zeros, y-intercepts, and asymptotes.

$$y = \frac{x-2}{x^2-2x-8}$$



11). Completely expand the following:

$$\log\left[\frac{4x^3}{y^2(x-1)^5}\right]$$

12). Solve for x:

$$\log_3(x-8) + \log_3 x = 2$$

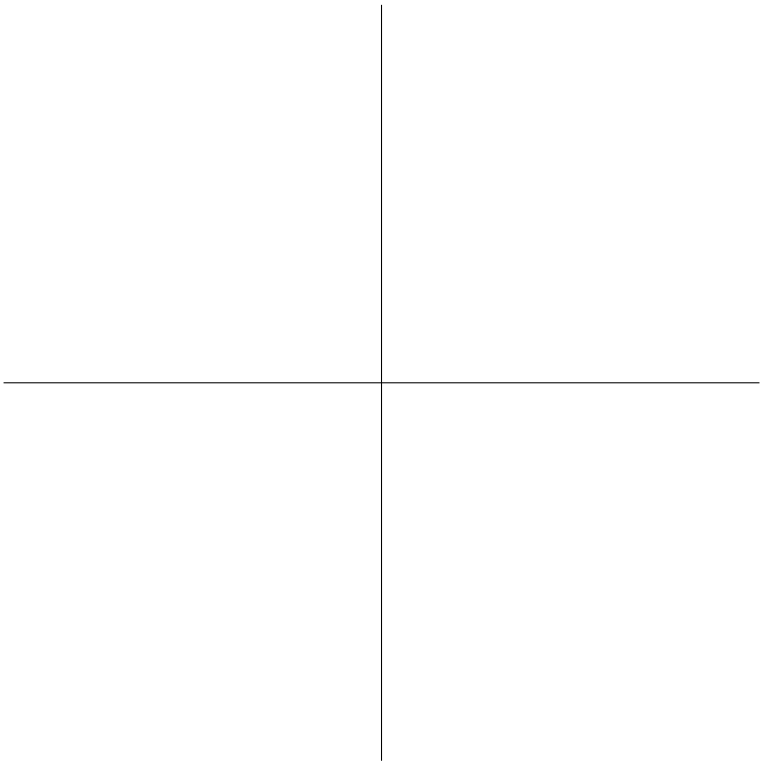
13). A sample of bismuth-210 decayed to 33% of its original mass after 8 days. Find the half-life of this element.

14). Determine the standard form equation for an ellipse with foci at $(-2, 2)$ and $(4, 2)$ and a vertex at $(1, 6)$.

15). You are standing about 1 mile away from a hill. You notice someone hiking at the highest point of the hill. Your head is tilted up at an angle of 30°. How high is the hill?

16). Sketch the graph for one period of the following sinusoidal function. Be sure to show how you calculate the period and the five key points on the graph. Be sure to show the amplitude and the t values for the five key points.

$$y = -2\sin\left(\frac{\pi}{2}t - \frac{\pi}{6}\right)$$



17). Find all solutions to the following equation and state the answer in the most efficient possible form.

$$2\sin^2 x - 1 = 0$$

18). Find all solutions to the following equation:

$$sin^2 t = 4 - 2\cos^2 t$$

19). Simplify the following:

$$\cos(\sin^{-1} x + \cot^{-1} y)$$

20). Rewrite the following in $A\sin(\omega t + \phi)$ form:

$$\sin(2x) + \sqrt{3}\cos(2x)$$