Math-19 Practice Final Exam

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

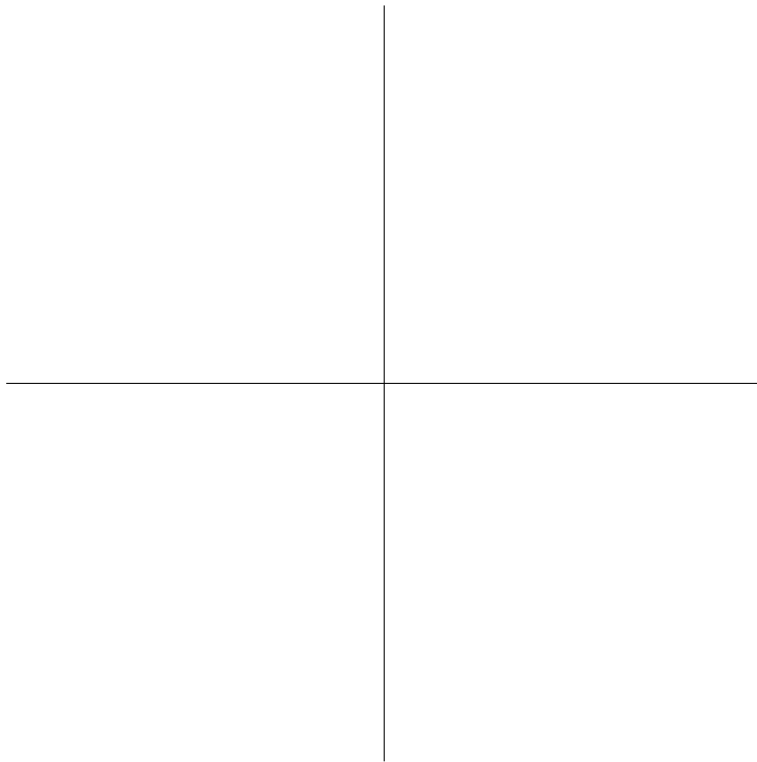$$\frac{27ab^2c^{-3}}{3a^3b^{-4}}$$

2). Solve for x:

$$\frac{1}{x-2} + \frac{1}{x+2} = \frac{8}{x^2-4}$$

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

$$x^2 + y^2 + 2x - 6y + 9 = 0$$

a). Convert to standard form.

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

4). The terminal velocity of a parachutist is directly proportional to the square root of his weight. A 160 lb parachutist attains a terminal velocity of 9 mph. What is the terminal velocity for a parachutist weighing 240 lb?

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

6). Consider the function $h(x) = |x| + \sqrt{x} - 10$. Determine two functions $f(x)$ and $g(x)$ such that $h = g \circ f$.

7). Consider the following function:

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

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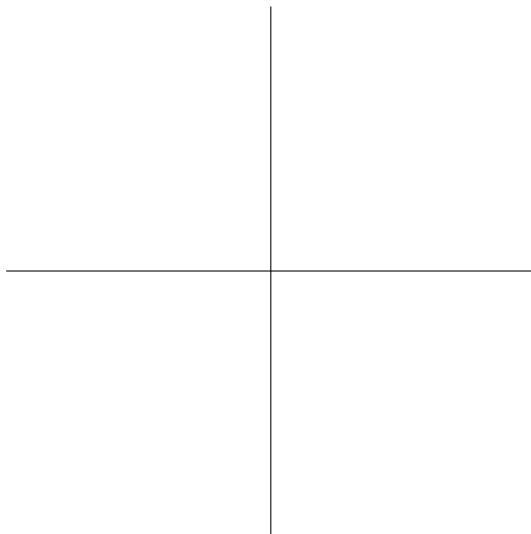
    i.

    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.

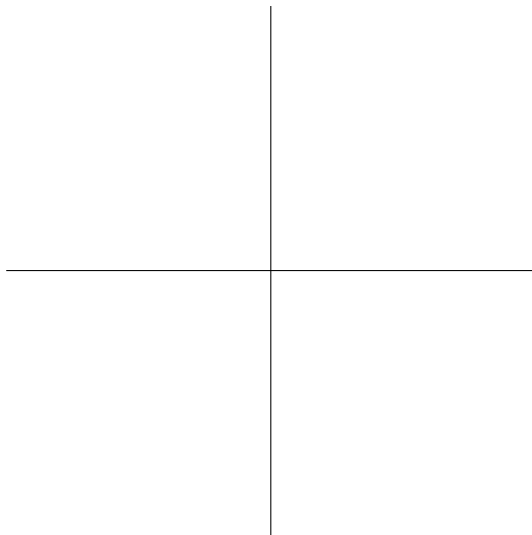8). Consider the following parabola in general form:

$$y = -2x^2 + 12x$$

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:

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

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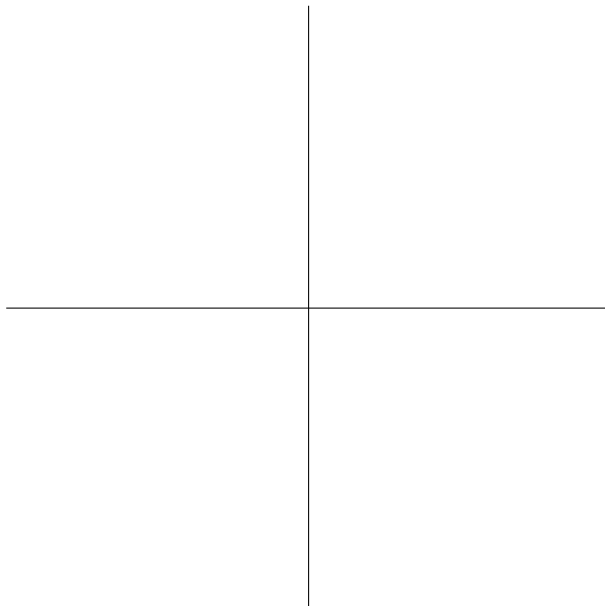
10). Sketch the following rational function. Be sure to show the proper end behavior and label all zeros, y-intercepts, and asymptotes.

$$y = \frac{x - 3}{x^2 + x - 6}$$
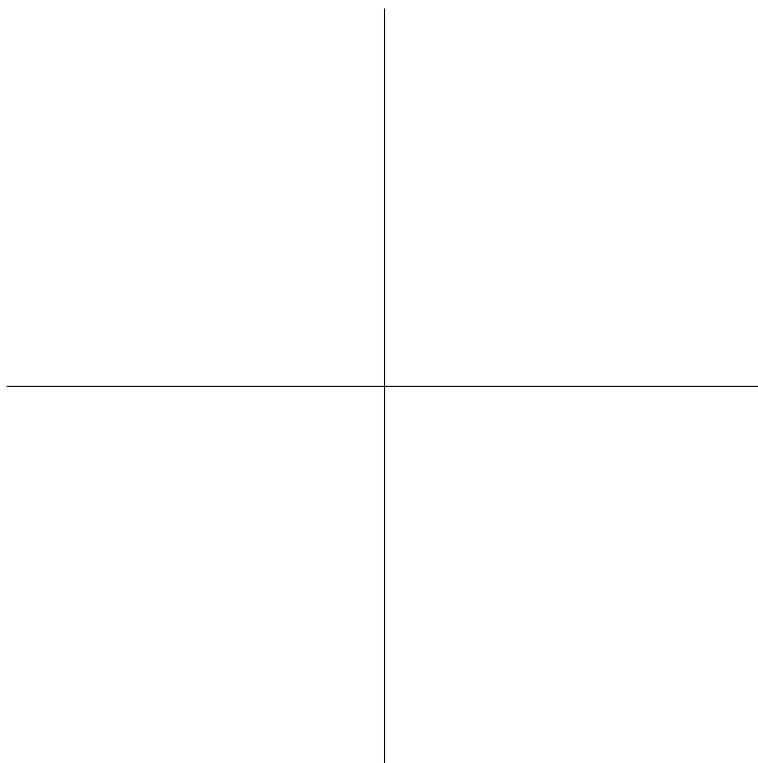
11). Completely expand the following:

$$\log \left[\frac{x\sqrt{x^2 + 1}}{(x - 1)y^2} \right]$$

12). Solve for x:

$$\log_8(x - 5) - \log_8(x - 2) = 1$$

13). A sample of palladium-100 decayed to 29.73% of its original mass after 7 days. Find the half-life of this element.

14). Determine the standard form equation for an ellipse with foci at $(-1, 3)$ and $(-1, -1)$ and a vertex at $(-1, 4)$.

15). You are standing about 5 ft from your car when you notice a bird on a power line above your car. To your horror, the bird poops on your just washed and waxed car. You look up at the bird with extreme anger at an angle of $76°$. How high up is the bird?

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.

$$y = 3\sin\left(\frac{\pi}{4}t - \frac{\pi}{2}\right)$$
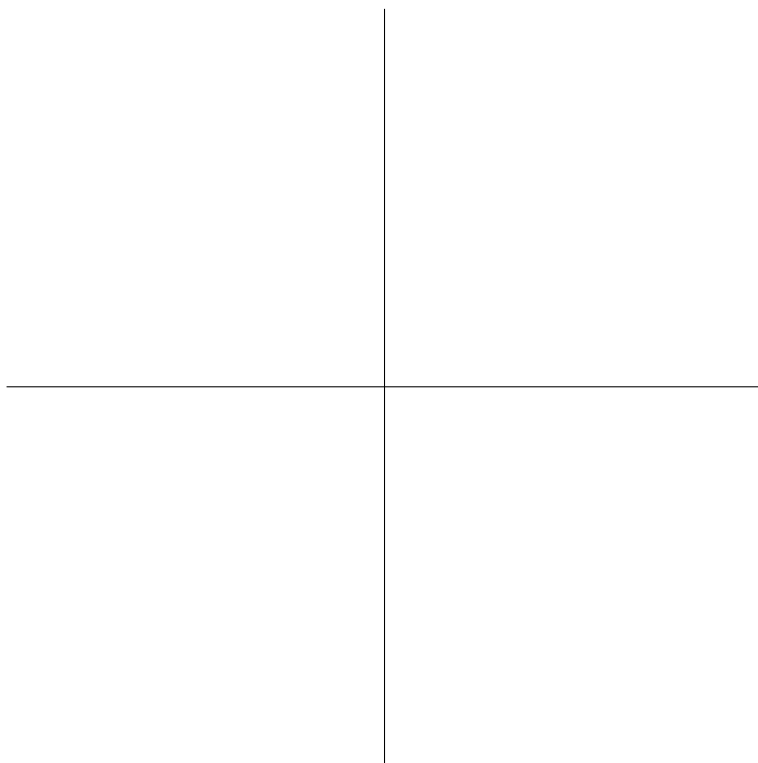
17). Find all solutions to the following equation and state the answer in the most efficient possible form.

$$4\cos^2 x - 3 = 0$$

18). Find all solutions to the following equation:

$$2\cos^2 t + \sin t = 1$$

19). Simplify the following:

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

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

$$\sin(x) - \cos(x)$$