Math-19 Exam #2

Name: _____

This exam is closed book and notes. You may use a calculator; however, no cell phones or tablets are allowed. You are also allowed notes on both sides of a 3x5" note card. Show all work; there is no credit for guessed answers. All values should be exact unless you are specifically asked for an approximate value answer. In particular, you may leave answers to trig questions in terms of π.

1). You have two dogs: Fido and Fluffy. Each dog is tied to its own stake in your backyard by a leash. Fido's stake and leash allow him to roam around an area defined by:

$$(x - 2)^2 + (y - 1)^2 = 9$$

Fluffy's stake and leash allow her to roam around an area defined by:

$$x^2 + y^2 - 10x - 8y + 37 = 0$$

   a). What are the coordinates of Fido's stake and the length of his leash?

   b). What are the coordinates of Fluffy's stake and the length of her leash?

2). What is the equation of the line between the two stakes, in slope-intercept form?

3). It is mating season. Fido and Fluffy and not fixed, but you do not want them to mate. Is this a problem based on the positions of the two stakes and the lengths of the leashes? (Hint: determine the distance between the two stakes and compare to the lengths of the leashes).

4). To be safe, you decide to erect a straight wall that is perpendicular to the line joining the two stakes and going through the midpoint of that line. What is the equation of the wall, in slope-intercept form?

5). The area A of a sector of a circle defined by a central angle θ and its subtended arc is jointly proportional to θ and the square of the radius r of the circle. Let k be the constant of proportionality.

    a). Write an expression for A in terms of k, r, and θ.

    b). If $\theta = 90°$ then the defined sector has an area that is one-fourth of the area of the circle. Use this information to determine k.

6). Consider the function:

$$f(x) = -(x+1)^3 - 8$$

a). Provide a list of transformations, starting from a basic graph, for the function in the order that they are applied.

    i.

    ii.

    iii.

    iv.

b). Sketch the graph. Be sure to calculate and label all important points (including intercepts). Remember, this is a sketch - do not waste time and space trying to draw the graph to exact scale.

7). Consider the function:

$$f(x) = x^2 + 1$$

Determine the average rate of change of the function from $x = a$ to $x = a+h$ and simplify the resulting expression.

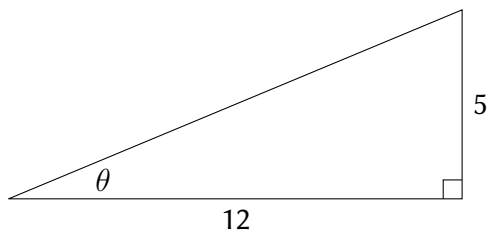8). Consider the following two functions:

$$f(x) = \sqrt{x+1}$$
$$g(x) = x^2$$

a). Determine $\left(\frac{f}{g}\right)(x)$ and state its domain in interval notation.

b). Determine $(g \circ f)(x)$ and state its domain in interval notation.

9). Consider the following triangle:

Determine all six basic trigonometric ratios.

10). You want to measure the height of a tree; however, you can't reach the top to measure it with a tape measurer. So you stand 10 feet from the tree, look up to the top of the tree at an angle of $45°$ and look down at the bottom of the tree at an angle of $\frac{\pi}{6}$ radians. How tall is the tree (to the nearest tenth of a foot)?