

## Math-19 Exam #3

Name: \_\_\_\_\_

This exam is closed book and notes. 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 unless you are specifically asked for an approximate value answer. In particular, trig answers should be left in terms of  $\pi$  unless otherwise directed.

1). Identify the following formulas. Be specific regarding orientation.

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

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$$c^2 = a^2 + b^2 - 2ab \cos \theta$$

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$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

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$$(x - h)^2 = 4p(y - k)$$

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$$(y - k)^2 = 4p(x - h)$$

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$$(x - h)^2 + (y - k)^2 = r^2$$

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$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$

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$$\frac{(y-k)^2}{a^2} + \frac{(x-h)^2}{b^2} = 1$$

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$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

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$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

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2). Consider the following trigonometric function:

$$y = -2 \cos\left(2\pi x - \frac{\pi}{2}\right)$$

- a). What is the amplitude (A)?
  
  
  
  
  
  
  
  
  
  
- b). What is the period (P)?
  
  
  
  
  
  
  
  
  
  
- c). What is the horizontal translation (b)?
  
  
  
  
  
  
  
  
  
  
- d). Sketch one period of the function on the interval  $[b, b + P]$ .

3). The following problem asks you to derive various trigonometric identities, starting from the cosine addition formula.

a). State the cosine addition formula.

b). State the cosine subtraction formula (hint: even/odd).

c). Derive the sine addition formula (hint: cofunction identity).

d). Derive the sine subtraction formula (hint: even/odd).

e). Derive the  $\cos x \sin y$  sum to product formula.

4). Find an exact value for  $\cos 105^\circ$ .

5). State the cos/sin version of the pythagorean identity and then derive the other two forms (tan/sec and cot/csc).

6). Prove the following identity:

$$\frac{1}{\sec x - \tan x} - \frac{1}{\sec x + \tan x} = 2 \tan x$$

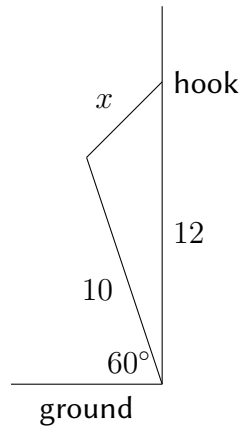
7). Find all solutions.

$$\cos^2\left(\frac{x}{2}\right) = \frac{3}{4}$$

8). Write as a function of  $x$ :

$$\sin\left(\cos^{-1}x + \sin^{-1}x\right)$$

- 9). A 10-foot pole is suspended against a building such that the bottom of the pole is where the building meets the ground and the top of the pole is connected by a rope to a hook that is 12 feet up on the side on the building. The angle the pole makes with the ground is  $60^\circ$ .



What is the length  $x$  of the rope, accurate to one decimal place?

- 10). Consider the following equation:

$$x^2 + 4y^2 - 2x + 16y + 13 = 0$$

- a). Explain how by looking at the equation you can tell that this is an ellipse.

b). Put the equation in standard form.

c). What are the coordinates of the center?

d). What is  $a$ ?

e). What is  $b$ ?

f). What is  $c$ ?

g). What are the four vertices?

h). What are the two foci?

i). Sketch the ellipse. Be sure to label all of the above values.