**MATH 3 FINAL EXAM 2016** **Name: _____**

**Teacher (Circle one):** **Doucette** **Runge**

| Section 1 | Section 2 | Section 3 | Section 4 | Section 5 |
|---|---|---|---|---|
| /24 | /8 | /28 | /28 | /16 |

Total: /104

**Directions:** Show all work for full credit. Each learning target will be graded out of 4 points.

**Section 1: Polynomials**

**LT-3:** Solve the following equation for $x$.

$$x^2 + 10x - 24 = 0$$

**LT-4:** Factor the following expression completely.

$$6x^2 + 7x - 3$$

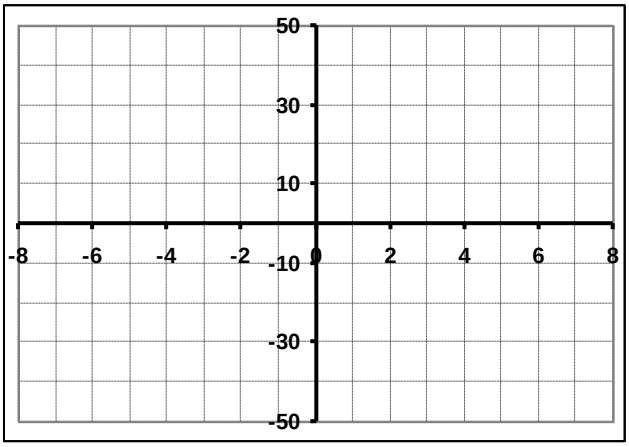
**LT-1:** Suppose $f(x) = 3x + 4$ and $g(x) = 2x - 4$. Find each of the following.

**a.** $f(x) - g(x)$ **b.** $f(3) + g(2)$

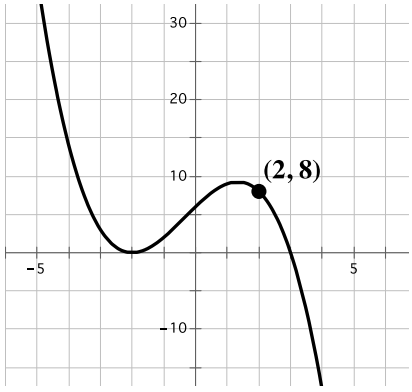
**LT-6:** Consider the polynomial $f(x) = -2x^4 + 10x^3 + 16x^2 - 96x$. Note that if you factor *f*(*x*), you get $f(x) = -2x(x+3)(x-4)^2$. Identify the degree, leading coefficient, and end behavior of this polynomial.

degree: leading coefficient: end behavior:

**LT-7:** Graph *f*(*x*) on the grid below.




**LT-8:** Write the equation for the polynomial graphed below. Remember to solve for the exact leading coefficient.




**Final answer:** *f*(*x*) = _____

## Section 2: Sequences and Series

**LT-10** and **LT-11:** Evaluate each of the following sums using either Gauss's Method or Euclid's Method. Note: You will not earn any credit if you do not show work.

**a.** $S = 4 + 12 + 36 + ... + 2,916$

**b.** $S = 20 + 17 + 14 + ... + -1$

**Section 3: Probability and Statistics**

**LT-19:** Suppose the scores on this final exam have the following statistics.

$\bar{x} = 75$ $\quad s^2 = 100$ $\quad s = 10$

Suppose Mr. Doucette and Mrs. Runge decide to give each student 3 extra credit points. Find the mean, variance, and standard deviation for the new scores.

**LT-18:** A spinner has eight equal sections, labeled 2, 2, 2, 3, 3, 3, 5, and 8. Find the mean, variance, and standard deviation for a spin on this spinner.

| $x$ | Frequency | $x$ * Freq. | $x - \bar{x}$ | $\left(x - \bar{x}\right)^2$ | $\left(x - \bar{x}\right)^2$ * Freq. |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| **Totals** | | | | | |

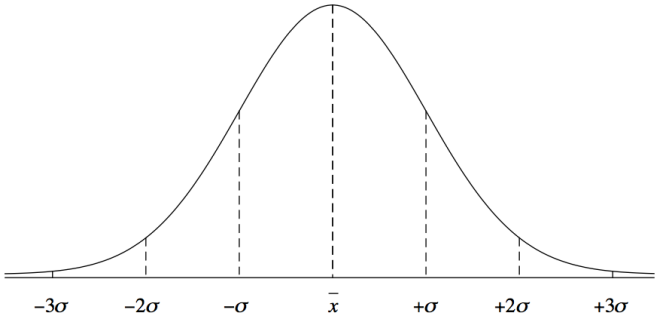
$\bar{x} =$ $\quad s^2 =$ $\quad s =$

**LT-21:** All 60 students in this course spun the spinner, and we add the results. Find the mean, variance, and standard deviation for the sum.

$\bar{x} =$ $\quad s^2 =$ $\quad s =$

**LT-24**, **LT-25**, and **LT-27:** LHS administrators are analyzing how many underclassmen are absent each day. They find there is a mean of 73 underclassmen absent, with a standard deviation of 6 underclassmen.

**a.** Label the curve below with the mean $\bar{x}$ and $\bar{x} \pm 1, 2, 3s$ values of absent students. Then find the probability that between 79 and 91 underclassmen are absent on any given day. Use the 68 – 95 – 99.7 rule, not a normal pdf/cdf function on your calculator.




**b.** Find the probability that between 63 and 77 underclassmen are absent on any given day. Write down what you plug into your calculator, and a final answer rounded to two decimal places.

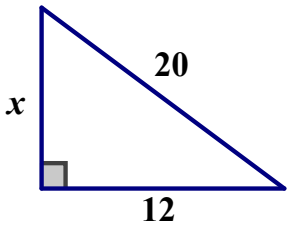
**c.** Last year on the day after finals 98 underclassmen were absent. Calculate the *z*-score and use the *z*-score to describe if this is an unusual number of absences.

**LT-29:** Suppose the LHS newspaper, *The Musket*, wants to collect data about who LHS students support in the presidential election. They decide to collect data by having the two *Musket* editors-in-chief survey their history classes. They survey their classes by having their history teachers add a question to the end of the next test, requiring students to check off which presidential candidate they most support. Identify two different problems with this survey design.

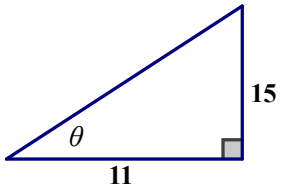
## Section 4: Trig and Sinusoids

**LT-31** to **LT-33:** Find the missing side or angle of the triangles below using the Pythagorean Theorem, trig, or inverse trig.

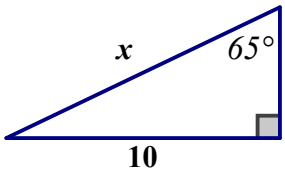
**a.**




**b.**



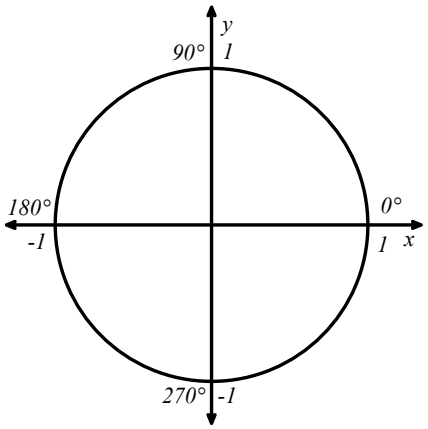

**c.**



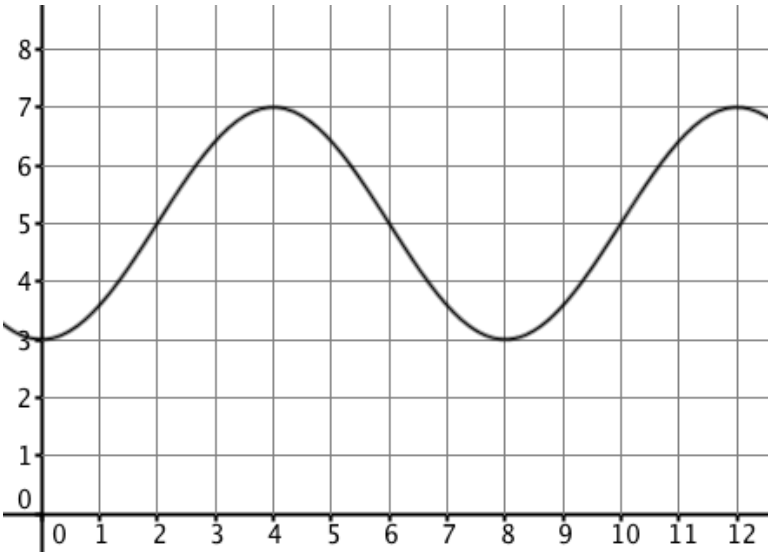

**LT-34:** You are in a sailboat on the ocean, 500 feet (horizontally) away from the base of a vertical cliff. You see the top of the cliff at an 6° angle of elevation. How tall is the cliff? Draw a picture and show all your work.

**LT-36:** Find all solutions to the following equation. Mark your angles on the unit circle.

$$5\cos q - 2 = -3$$



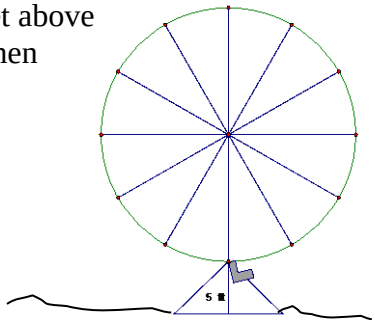

**LT-37:** Identify the important characteristics of the sinusoid graph below. Then write its equation.



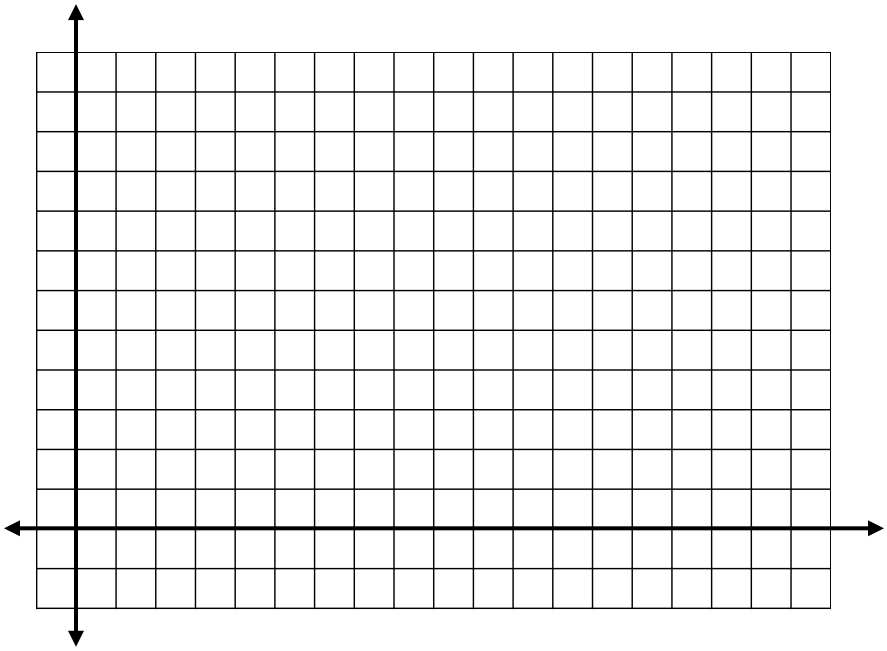

| **Important Features** |
|---|
| Max = |
| Min = |
| Midline = |
| Amplitude = |
| Period = |
| Sin/Cos?<br>+ / – ? |

**Equation:**

**LT-39:** A Ferris wheel is 30 feet in diameter and can be boarded at 5 feet above ground level. The wheel takes 4 minutes to complete a full cycle. When the ride starts (at time $x = 0$) you are in the 3 o'clock position on the wheel and ascending (going up).



**a.** Sketch a graph of this sinusoid.



| Important Features |
|---|
| Max = |
| Min = |
| Midline = |
| Amplitude = |
| Period = |
| Sin/Cos?<br>+ / – ? |

**b.** Write an equation for the sinusoid.

**c.** At what time will you first get to the very top of the wheel?

## Section 5: Exponentials and Logs

**LT-40:** Simplify each of the following.

**a.** $(4x^{-2}y^3)^2$

**b.** $\dfrac{3xy^2}{y^{-1}\sqrt{x}}$

**LT-41:** Write an equation for the table below.

| *x* | *y* |
|---|---|
| 1 | 8 |
| 2 | 12 |
| 3 | 18 |
| 4 | 27 |

**LT-42:**

**a.** Rewrite the following as a log equation.

$$2^x = 17$$

**b.** Rewrite the following as an exponential equation.

$$\log_8 x = 3$$

**LT-43:** Evaluate each of the following logs without your calculator and write an explanation to support your answer.

| Equation | Answer | Explanation (how do you know?) |
|---|---|---|
| **a.** $\log_{25} 5 = x$ | $x =$ | Because… |
| **b.** $\log_2 \frac{1}{8} = y$ | $y =$ | Because… |

**Bonus:** When you learn a new topic in Math class you feel that you understand it well enough to get a 100 on the test, but you know that over time you forget things. Suppose you forget 8% of the information about the topic each day.

**a.** Write an equation for the score on the test you would get after $x$ days.

**b.** You want to get at least a C+ on the test. After how many days would you get a 77 on the test? Round to the nearest day.