Name & Date: _____

<u>**Algebra II Final Exam**</u>
This exam consists of two parts: a detailed quiz covering Chapter 4 with harder problems, and a general test covering the entire course with easier problems.

The quiz and test will be graded separately. The general test will carry twice the weight of the Chapter 4 quiz.

Of the two hours available for this test, you should devote more effort to the final test because the problems are easier and they count for more.

A scientific calculator can come in handy for this test, and will be provided upon request.
A pencil and eraser will prove even more useful than a calculator to completing this exam.

<u>**Part 1: quiz on Chapter 4, Sections 2 & 3**</u>

Summary of the Properties of Logarithms

The Product Rule:	$\log_a MN = \log_a M + \log_a N$
The Power Rule:	$\log_a M^p = p \log_a M$
The Quotient Rule:	$\log_a \dfrac{M}{N} = \log_a M - \log_a N$
The Change-of-Base Formula:	$\log_b M = \dfrac{\log_a M}{\log_a b}$
Other Properties:	$\log_a a = 1, \qquad \log_a 1 = 0,$
	$\log_a a^x = x, \qquad a^{\log_a x} = x$

Problem 1:
Express in terms of sums and differences of logarithms: $\log_b \dfrac{x^2 y}{b^3}$

Problem 2:
Express in terms of sums and differences of logarithms: $\log_a \sqrt{\dfrac{a^6 b^8}{a^2 b^5}}$

Problem 3:
Express as a single logarithm and, if possible, simplify: $\ln 54 - \ln 6$

Problem 4:
Solve the logarithmic equation algebraically. $\log_2 x = -3$

Problem 5:

Read over the following employment solicitation:

Jonathon,

Full time - Permanent - NYC - Quant/Software Engineer - 350 K Plus Total Comp

A growing credit fund within Manhattan is actively looking to add top talent to their technology and analytics team. The right candidate will be able to join a group that is responsible for all of the firm's in-house tools and analytics for the funds traders, PMs, risk management and operations staff. This team is responsible for a range of applications from trade capture to market data feeds to valuation models to risk analysis/reporting to trade processing - to name a few, which requires interaction with the business to gather their requirements.

These skills are a must
-excellent OOP skills (ideally C#, but open to C++ or Java)
-Strong experience with relational DB schema design and optimization
-Effective communication skills

(PS - I am working similar roles in CONNECTICUT, NEW JERSEY, TEXAS, AND CALIFORNIA, if interested).

Additionally, if you think any friends would be interested, I am more than happy to help them out as well.

Thanks!

Joseph Cooper
Banking Technology Division
Huxley
+1 212 707 8112

Question A: Write down the minimum total compensation offered for this position: $_____

Question B: Calculate $\log(Salary)$:_____

Question C:
If salary were paid in pennies instead of dollars, use the Product Rule to calculate $\log(Salary \, x \, 100)$

Problem 1:

Consider the numbers

$$-8, \ \frac{11}{3}, \ \sqrt{15}, \ 0, \ -5.49, \ 36, \ \sqrt[3]{7}, \ 10\frac{1}{6}.$$

a) Which are integers?
b) Which are rational numbers?
c) Which are rational numbers but not integers?
d) Which are integers but not natural numbers?

Problem 2:
Convert to scientific notation: 0.0000367

Problem 3:

Compute and write scientific notation for the answer:

$$\frac{2.7 \times 10^4}{3.6 \times 10^{-3}}.$$

Problem 4:

Simplify:

$$x^{-8} \cdot x^5$$

$$(2y^2)^3(3y^4)^2$$

$$(-3a^5b^{-4})(5a^{-1}b^3)$$

$$(3x^4 - 2x^2 + 6x) - (5x^3 - 3x^2 + x)$$

$$(x + 3)(2x - 5)$$

$$(2y - 1)^2$$

Problem 5:

Who drew this caricature?
a) Nosson Cotlar
b) Menachem Deray
c) Levi Shusterman
d) Aryeh Weinstein
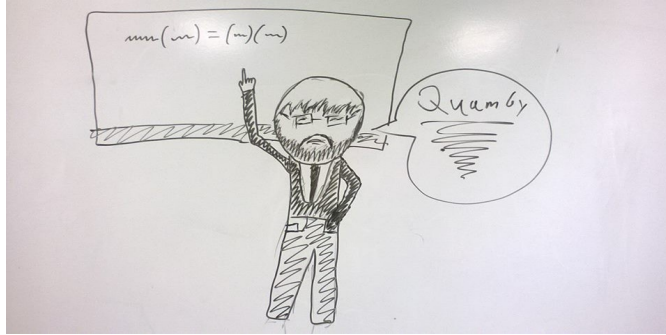
Problem 6:

What is your favorite color?
a) Red
b) Green
c) "Red... No, Green!"
d) Orange

Problem 7:
Identify each car from the list below. Then, circle the vehicle that is *The Greatest Car in the World*, according to Mr. Schuler.
a) 2017 Ford Mustang Shelby GT 500
b) 2015 Dodge Challenger SRT Hellcat
c) 2008 Honda Odyssey EX
d) 2014 Nissan GT-R

Problem 8

Under the Fahrenheit scale, water freezes at '32' and boils at '212' (at 1 atmosphere of pressure).
Under the Celsius scale, water freezes at '0' and boils at '100' (at 1 atmosphere of pressure).

Given those two 2 points, derive a linear equation ("Y=mX+b") that relates Fahrenheit to Celsius (that is, "F = mC + b". You need to figure out the 'm' and the 'b' of that equation)
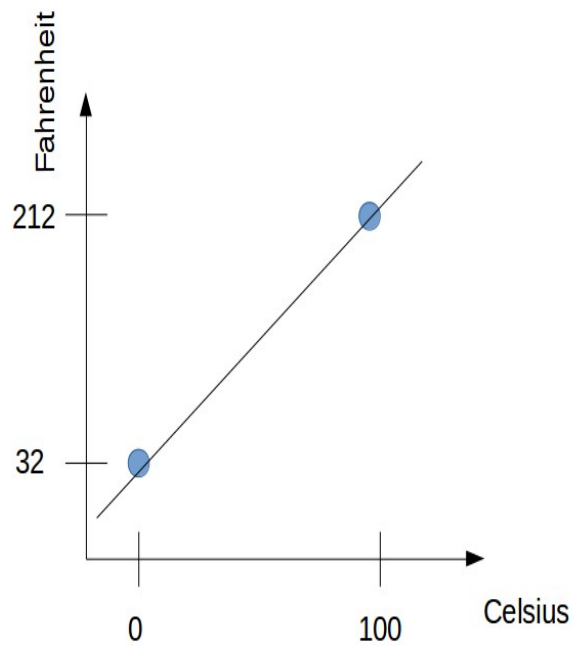
Problem 9
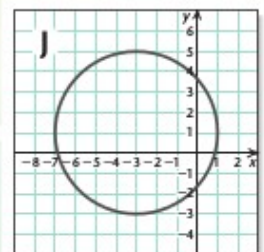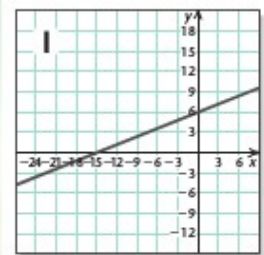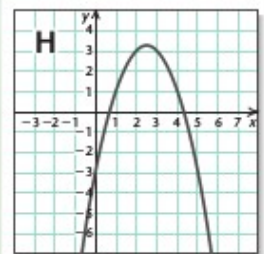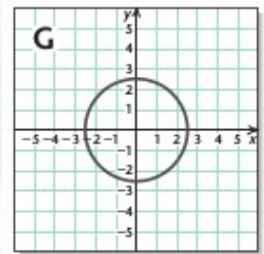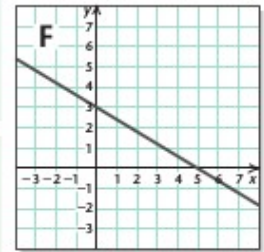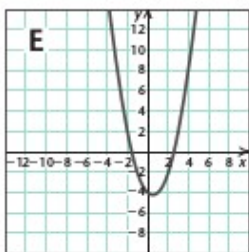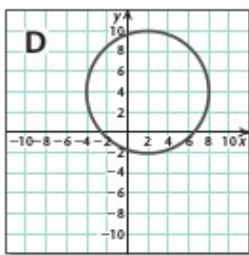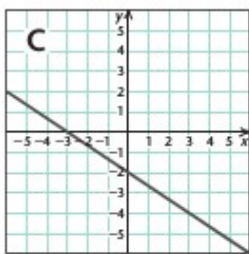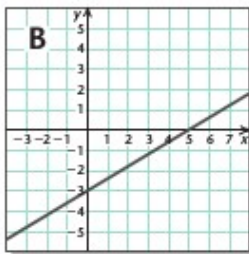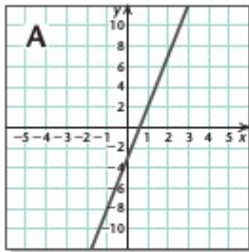
Visualizing the Graph

Match the equation with its graph.

1. $y = -x^2 + 5x - 3$

2. $3x - 5y = 15$

3. $(x - 2)^2 + (y - 4)^2 = 36$

4. $y - 5x = -3$

5. $x^2 + y^2 = \dfrac{25}{4}$

6. $15y - 6x = 90$

7. $y = -\dfrac{2}{3}x - 2$

8. $x^2 + y^2 + 6x - 2y - 6 = 0$

9. $3x + 5y = 15$

10. $y = x^2 - x - 4$

Answers on page A-4

Problem 10
Consider the following two functions.

$$f(x) = \frac{4}{x^2}; \ g(x) = 3 - 2x$$

Find:

$(f + g)(x)$

$(f - g)(x)$

$fg(x)$

$(f/g)(x)$

$(f \circ g)(x)$

$(g \circ f)(x)$