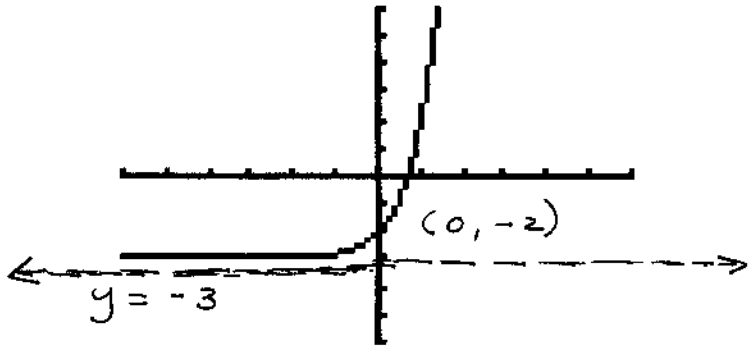
UNIVERSITY OF DELAWARE

M114 – 01S

EXAM III

The following 14 multiple choice questions are worth 5 points each.

1. Given the following graph, determine its equation.



a. $y = (3)5^x$

b. $y = 5^x - 3$

c. $y = -5^x + 3$

d. $y = 3^x - 5$

2. Simplify: $\ln e^{(2x+5)}$

a. $2x + \ln 5$

b. $2x + 5$

c. $e^{(2x+5)}$

d. $10x$

e. It cannot be simplified.

3. Determine the value of $\log_5 55$.

a. 2.4899

b. 11.0000

c. 55.000

d. 4.0073

e. 1.7404

4. Rewrite as the logarithm of a single quantity:
$2 \log_3 x + \log_3 (x+2)$

a. $\log_3 (3x+2)$

b. $\log_3 (x^2 + x + 2)$

c. $\log_3 2x(x+2)$

d. $\log_3 (2x+2)^2$

e. $\log_3 x^2 (x+2)$

5. Use the properties of logarithms to write the expression as a sum, difference, and/or multiple of logarithms.

$$\ln\left(\frac{2}{\sqrt{x^2+25}}\right)$$

a. $\ln 2 - \ln x + \ln 5$

b. $2\ln x + \ln 25$

c. $\ln 2 - \frac{1}{2}\ln(x^2+25)$

d. $\ln 2 - \ln x + \ln 25$

e. $\ln(x^2+25)$

6. Given that the $\log_b 3 = .6826$ and $\log_b 7 = 1.2091$, evaluate $\log_b 63$.

a. 3.7834

b. 1.6750

c. 2.1445

d. 2.5743

7. The level of sound β, in decibels, of a sound with intensity I is given by:

$$\beta = 10\log_{10}\left(\frac{I}{I_0}\right)$$

where I_0 is 10^{-16} watts per square centimeter, the faintest sound that can be heard.

Determine the level of sound of an air hammer, which has intensity of $I = 10^{-6.5}$ watts per cm^2.

a. 55 decibels

b. 65 decibels

c. 75 decibels

d. 85 decibels

e. 95 decibels

8. Solve: $\ln 2x - \ln 3 = 5$

a. $\frac{15}{2}$

b. 4

c. $\frac{3e^5}{2}$

d. $\frac{e^5+3}{2}$

e. $\frac{2e^5}{3}$

9. A certain lake is stocked with 500 fish, and the fish population increases according to the following equation where t is measured in months.

$$P = \frac{10{,}000}{1+15e^{-t/5}}$$

Find the fish population after 10 months (nearest fish).

a. 900

b. 3300

c. 3500

d. 1000

10. Solve for x:

$$9 - 4e^x = 6$$

The correct solution is between:

a. 0 and 1

b. −1 and 0

c. 1 and 2

d. −2 and 1

11. Solve the following system of equations for the value of y.

$$\frac{2}{3}x+\frac{1}{6}y=\frac{2}{3}$$

$$5x-y=14$$

a. $y=0$

b. $y=4$

c. $y=-4$

d. $y=-2$

12. If you deposit \$8,000 in an account that pays 6% interest compounded continuously, how much will be in the account after 10 years?

a. \$14,326.78

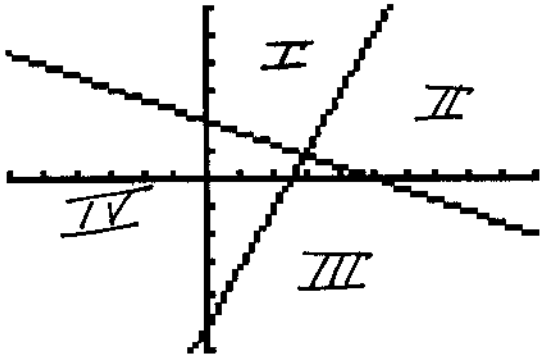
b. \$12,800.00

c. \$14, 576.95

d. \$13,353.25

13. Determine which region defines the solution set for the system of inequalities.

$$2x-y\geq 5$$
$$2x+5y\geq 10$$



a. I
b. II
c. III
d. IV

14. The population of a southern town was fairly constant for many years. Then a large amusement park was built nearby and the population began to grow according to the following table.

$t = 0$ corresponds to 1990

t	0	2	4	6	8
Population	2500	2700	2950	3450	4100

Find the exponential regression equation which models this data. ("a" and "b" should be correct to 3 decimals.)
Use your equation to predict the population of the town in 2005.

a. 5743

b. 5887

c. 6004

d. 6121

e. 6298

Name:_____ **Section:**_____

Instructor:_____

The following questions are free response.

15. The following table indicates the number of Apple Computers in schools in the last 15 years. Let N equal the number of computers (in millions) and let t represent the number of years since 1986.

t	0	2	4	6	8	10	12	14
N	0.6	1.2	1.8	2.2	2.15	1.6	1.4	0.8

Determine each of the following models. (Correct to 4 decimal places).
The value of R^2 for the quadratic model is given. [20 points]

a. Linear Model _____

b. Quadratic Model _____

($R^2 = .9537$)

c. Exponential Model _____

d. Explain which model best fits the data and why you made this decision.

e. Use your best model to predict the number of Apple computers in the schools in 2001.

16. The decay of radioactive radium (Ra^{226}) is given by $P = P_0 e^{kt}$.

a. Use the fact that radioactive radium has a half-life of 1620 years to determine the value k. (Correct to 5 decimal places) [4 pts]

b. If 0.15 grams remain after 1000 years, determine the initial quantity of radioactive radium. (Correct to 2 decimal places). [6 pts]