Name (Print): _____

Username.#: _____

Lecturer: _____

Rec. Instructor: _____

Rec. Time: _____

Math 1130
Spring
Sample Midterm 2b

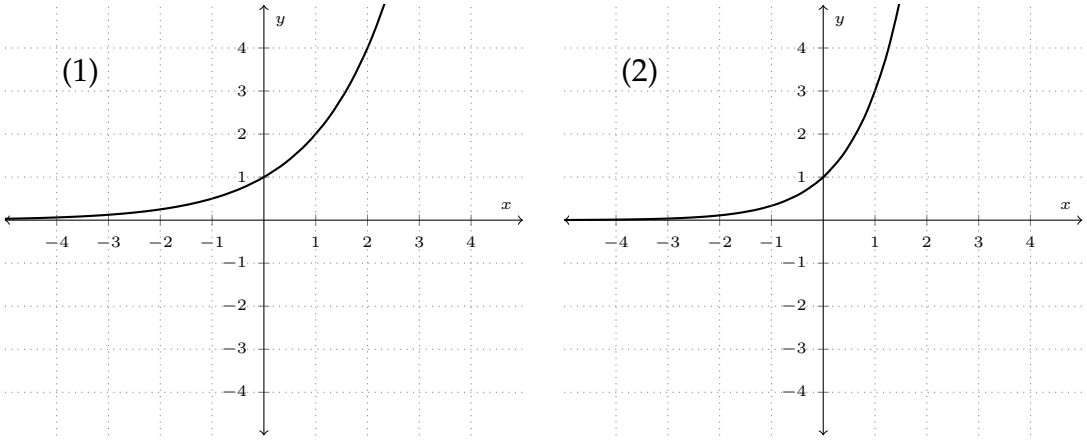
This exam contains 10 pages (including this cover page) and 9 problems. Check to see if any pages are missing. The exam is worth 100 points. The value of each question is listed below.

The following rules apply:

- You have **55 Minutes** to complete this exam.
- You may **not** use your books or notes on this exam.
- Please write clearly.
- **Partial Credit**: You are required to show your work on each problem of this exam. Incorrect answers with supporting work may receive partial credit. Any questions without supporting work will receive no credit. Partial credit might not be awarded on some questions.
- Calculators are permitted with the exception of calculators that have symbolic algebra or calculus capabilities. In particular, the following calculators (and their upgrades) are not permitted: TI-89, TI-92, TI-Nspire CX CAS, and HP-49. In addition, neither PDAs, laptops, nor cell phones are permitted.
- Unless otherwise specified, make sure your answers are in **exact form** (i.e. not a decimal approximation).
- Please write your answers in the boxes provided unless otherwise instructed.
- A random sample of graded exams will be copied before being returned.

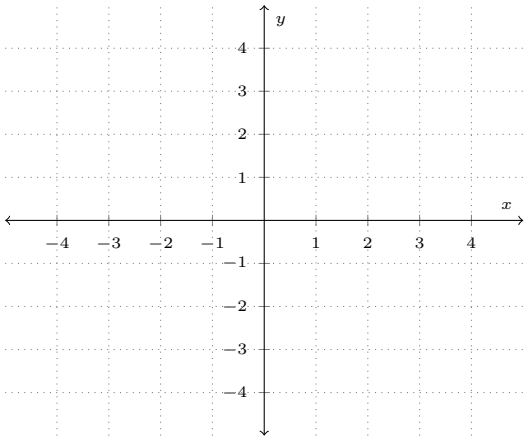
Page	Points	Score
2	10	
3	15	
4	15	
5	12	
6	14	
7	16	
8	18	
Total:	100	

1. The graphs shown here (labeled (1)-(2)) satisfy certain characteristics. Use them to respond to the parts below.



(a) (5 points) Graph (1) represents an exponential function. What is its base?

(b) (5 points) The function depicted in graph (2) has an inverse. Draw the inverse function in the space provided.



2. Answer the following parts; circle your choice for parts (a) and (b).

(a) (5 points) Suppose that $\log_5 x = b$. Then $x =$

(i) 5 (ii) b^5 (iii) x^5 (iv) 5^b

(b) (5 points) A one-to-one function has domain $[-3, 7)$. What is the range of the inverse function of f?

(i) $(-3, 7]$ (ii) $[-3, 7)$ (iii) $(-7, 3]$ (iv) $[-7, 3)$

(c) (5 points) Determine if the function given below is one-to-one. Make sure to explain your answer.

$$f(x) = (2x - 6)^2, \text{ for } x \geq 2$$

3. Demonstrate properties of logarithms and exponentials in the following parts.

   (a) (7 points) Let $f(t) = (1.09)^t$. Use logarithms to determine the value of t that solves the equation $f(t) = 3$. Give your answer to three decimal places.

$t =$ [ ]

   (b) (8 points) Use properties of logarithms and exponentials to evaluate the expression

$$\log_3 9^{2.7} + 4^{\log_4 2.2}$$

   No credit for solutions by calculator.

$\log_3 9^{2.7} + 4^{\log_4 2.2} =$ [ ]

4. Use properties of logarithms to solve the following parts.

(a) (6 points) Determine all values x that satisfy the equation:

$$\log_3(x-3) + \log_3(x+1) = \log_3 21$$

$x =$ _____

(b) (6 points) Determine all values x that satisfy the equation:

$$\log_x(5x+14) = 2$$

$x =$ _____

5. (6 points) Rewrite the given expression in terms of $\ln x$, $\ln y$ and $\ln z$.

$$\ln \frac{x^2 \sqrt[4]{y}}{z^3}$$

$$\ln \frac{x^2 \sqrt[4]{y}}{z^3} = \boxed{}$$

6. (8 points) A quadratic function is given below. Determine the vertex of the function. Make sure to show all of your work, and give your answer as an ordered pair!

$$y = 4x^2 + 2.4x - 5$$

The vertex is located at (_____, _____)

7. (a) (8 points) $\$650$ is deposited into an account today. The account earns a nominal rate of interest of 7.1% compounded quarterly. How much is in the account after 2.25 years? Give your answer to two decimal places.

The account balance is

(b) (8 points) The principal of an account is \$3000. The account will earn \$1017.31 in interest over four years. The interest rate of the account, r, is compounded continuously. Determine the value of r as a percent rounded to two decimal places.

The deposit is

8. (8 points) What is the effective rate of interest that is equivalent to a nominal rate of interest of 9.1% compounded semiannually? Give your answer as a percent rounded to two decimal places (for example, your answers should look like 1.27%)

The effective rate of interest is

9. (10 points) An investment of $\$12,000$ today will have a cash flow of $\$3000$ in one year, $\$4000$ in two years, and $\$7000$ in three years. Determine the net present value of the cash flows assuming an interest rate of 4.3% compounded annually. Give your answer to the nearest penny.

The net present value is

Scrap work

$$S = P(1+r)^n$$

$$S = Pe^{rt}$$

$$P = S(1+r)^{-n}$$

$$P = Se^{-rt}$$

$$r_e = \left(1+\frac{r}{n}\right)^n - 1$$

$$r_e = e^r - 1$$