

Math 1130
Autumn
Sample Exam 2a

Name (Print): _____

Username.#: _____

Lecturer: _____

Rec. Instructor: _____

Rec. Time: _____

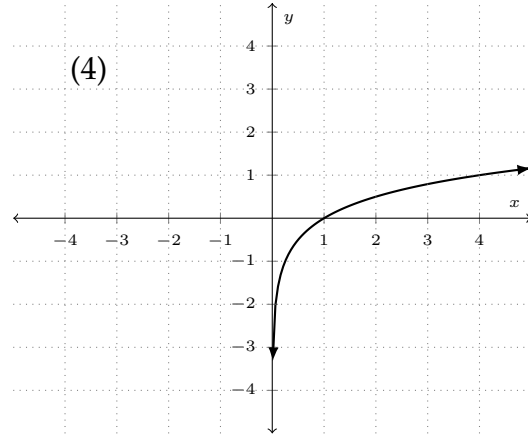
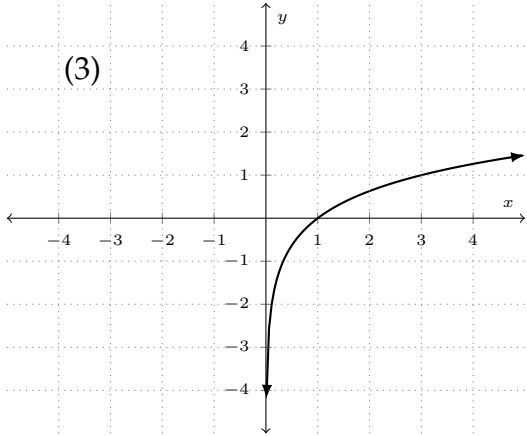
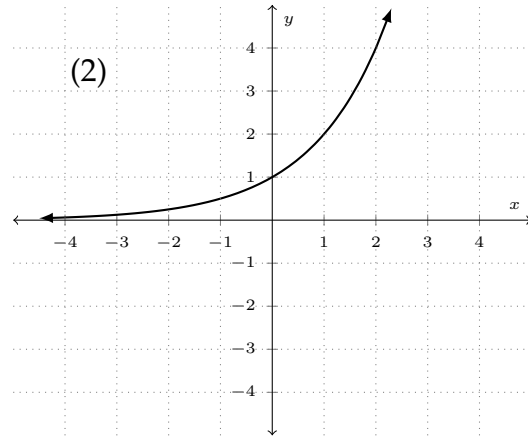
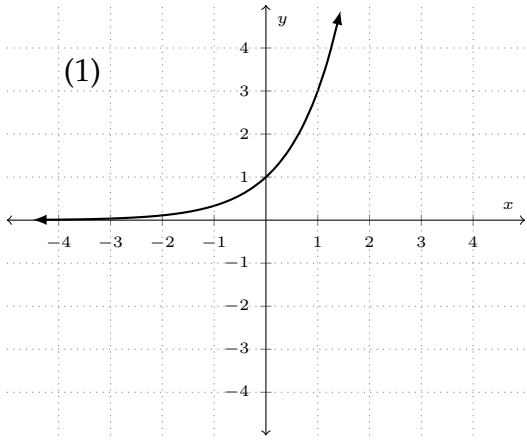
This exam contains 10 pages (including this cover page) and 9 problems. Check to see if any pages are missing. The exam is worth 100 points. The value of each question is listed below.

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	12	
3	17	
4	14	
5	16	
6	24	
7	11	
8	6	
Total:	100	

1. The graphs shown here (labeled (1)-(4)) satisfy certain characteristics. Use them to respond to the parts below.



- (a) (4 points) Graph (1) represents an exponential function. What is its base?

- (b) (4 points) This graph is a logarithm with base 4. This best describes graph

- (c) (4 points) Which two graphs above are inverse to one another?

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

(a) (6 points) Suppose that $\log_4 x = b$. Then $x =$

(i) x^4

(ii) 4^b

(iii) 4

(iv) b^4

(b) (6 points) A one-to-one function has domain $[-27, 33]$. What is the range of the inverse function of f ?

(i) $(-27, 33]$

(ii) $[-27, 33)$

(iii) $(-33, 27]$

(iv) $[-33, 27)$

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

$$f(x) = (3x - 7)^2, \text{ for } x \geq 0$$

3. (9 points) Thorium-233 has a half life of 22 minutes. A scientist has 1073 grams of Thorium-233; the decay function is

$$f(t) = 1073 \cdot \left(\frac{1}{2}\right)^{\frac{t}{22}}.$$

How long will it take for the scientist's Thorium-233 to decay to 200 grams? Give your answer in minutes rounded to one decimal place.

$$t = \boxed{}$$

4. (5 points) Use properties of logarithms and exponentials to evaluate the expression

$$\log_2 \ln e^8$$

Your answer should be a whole number. No credit will be awarded for calculator answers!

$$\log_2 \ln e^8 = \boxed{}$$

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

(a) (8 points) Determine all values x that satisfy the equation:

$$\log_6(x - 3) + \log_6(x + 8) = \log_6 42$$

$$x = \boxed{}$$

(b) (8 points) Rewrite the given expression in terms of $\ln x$, $\ln y$ and $\ln z$.

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

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

6. (a) (8 points) \$327 is deposited into an account today. The account earns a nominal rate of interest of 9.3% compounded monthly. How much is in the account after 2.5 years? Give your answer to two decimal places. **Write the formula that you use to calculate the account balance.**

The account balance is

- (b) (8 points) You deposit \$500 into an account today so that you have \$800 in the account in 5 years. The rate of interest is r compounded continuously. Calculate r to two decimal places. **Write the formula that you use to calculate r .**

$r =$

7. (8 points) What is the effective rate of interest that is equivalent to a nominal rate of interest of 10.3% compounded quarterly? Give your answer as a percent rounded to two decimal places (for example, your answers should look like 1.27%). **Write the formula that you use to calculate the effective rate.**

The effective rate of interest is

8. You decide to start saving for retirement. You begin making monthly deposits of \$200 into an investment account starting at the end of this month. You continue making these deposits for 42 years. The account's interest rate is a nominal rate of 8.4%, compounded monthly.

(a) (8 points) How much will you have at retirement in 42 years? Round your answer to two decimal places. *Hint: your answer should be between 500,000 and 1,000,000.*

Amount at retirement=

(b) (3 points) What is the sum of your deposits?

The sum is

9. (6 points) An investment of \$10,000 today will have a cash flow of \$1000 in one year, \$5000 in two years, and \$6000 in three years. Determine the net present value of the cash flows assuming an interest rate of 5% compounded annually. Give your answer to the nearest penny.

Answer:

Scrap work

Some Useful Formulas

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

$$S = Pe^{rt}$$

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

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

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

$$r_e = e^r - 1$$

$$\sum_{i=1}^{\infty} a \cdot r^{i-1} = \frac{a}{1 - r}$$

$$\sum_{i=1}^k a \cdot r^{i-1} = \frac{a(1 - r^k)}{1 - r}$$

$$A = Ra_{\overline{n}|r} = R \cdot \left[\frac{1 - (1 + r)^{-n}}{r} \right]$$

$$R = \frac{A}{a_{\overline{n}|r}} = A \cdot \left[\frac{r}{1 - (1 + r)^{-n}} \right]$$

$$S = Rs_{\overline{n}|r} = R \cdot \left[\frac{(1 + r)^n - 1}{r} \right]$$

$$R = \frac{S}{s_{\overline{n}|r}} = S \cdot \left[\frac{r}{(1 + r)^n - 1} \right]$$