Name (Print): _____

Username.#: _____

Lecturer: _____

Rec. Instructor: _____

Rec. Time: _____

Math 1130
Autumn
Sample Exam 2b

This exam contains 8 pages (including this cover page) and 6 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.
- You are required to show your work on Problems 4, 5, and 6.
  No work is required for Problems 1, 2, or 3.
- **Partial Credit**: Incorrect answers with supporting work may receive partial credit.
  Problems 4, 5, and 6 will receive no credit if there is no supporting work.
  Partial credit will not be awarded on Problems 1, 2, or 3.
- Calculators are permitted except for 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, you may not use PDAs, laptops, or cell phones.
- Unless otherwise specified, write your answers 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	20	
3	15	
4	15	
5	26	
6	24	
Total:	100	

1. For each of the following multiple choice questions, **circle the correct answer**. You do **not** need to show your work.

   (a) (5 points) A certificate of deposit is purchased for $4000. If the certificate earns interest at a rate of 3%, compounded monthly, what is the value of the certificate at the end of 4 years?

   (a) $4040.15 (b) $4502.04 (c) $4509.31

   (d) $4121.66 (e) $16529.01 (f) None of the above

   (b) (5 points) Find the inverse function f^{-1} to the function f given below with the specified restriction.

   $$f(x) = (4x-3)^2 \qquad \text{for } x \geq \frac{3}{4}$$

   (a) $f^{-1}(x) = \sqrt{4x-3}$ (b) $f^{-1}(x) = \frac{\sqrt{x}+3}{4}$ (c) $f^{-1}(x) = 8(4x-3)$

   (d) $f^{-1}(x) = \frac{1}{(4x-3)^2}$ (e) $f^{-1}(x) = \frac{x+3}{4}$ (f) None of the above

   (c) (5 points) Which of the following equations is equivalent to

   $$\log_2(x) = y\,?$$

   (a) $2^x = y$ (b) $y^x = 2$ (c) $x^y = 2$

   (d) $x^2 = y$ (e) $2^y = x$ (f) None of the above

   (d) (5 points) Suppose $4000 is invested at an annual rate of 7%, compounded continuously. Find the compound amount after 6 years, rounded to the nearest cent.

   (a) $2628.19 (b) $2665.37 (c) $4290.03

   (d) $6002.92 (e) $6087.85 (f) None of the above

2. For each of the following multiple choice questions, **circle the correct answer**. You do **not** need to show your work.

   (a) (5 points) A company invests X (in dollars) at the end of each year for 8 years, and the invested amount earns interest at a rate of 5%, compounded annually. At the end of the 8th year, the company's total investment is worth \$100,000. Find X, rounded to the nearest dollar.

   (a) \$10,472 (b) \$12,500 (c) \$15,472

   (d) \$646,321 (e) \$954,911 (f) None of the above

   (b) (5 points) Solve for x in the equation below.

$$\log_3(x+2) = -1$$

   (a) $x = -2$ (b) $x = \dfrac{-17}{9}$ (c) $x = \dfrac{-5}{3}$

   (d) $x = 1$ (e) $x = 7$ (f) None of the above

   (c) (5 points) Find the term a_4 of the sequence defined recursively as follows:

$$a_1 = 1 \qquad \text{and} \qquad a_{k+1} = k - a_k \text{ for } k \geq 1.$$

   (a) 0 (b) 1 (c) 2

   (d) 3 (e) 4 (f) None of the above

3. For each of the following multiple choice questions, **circle the correct answer**. You do **not** need to show your work.

(a) (5 points) Solve for x in the equation below.

$$\log_4(x-3) = 1 + \log_4(2)$$

(a) $x = 5$ (b) $x = 6$ (c) $x = 8$

(d) $x = 9$ (e) $x = 11$ (f) None of the above

(b) (5 points) An investment earns interest at a nominal rate of 3%, compounded semiannually. Find the effective rate as a percent, rounded to two decimal places.

(a) 1.50% (b) 2.96% (c) 3.00%

(d) 3.02% (e) 6.09% (f) None of the above

(c) (5 points) A debt of \$800 is due in 5.5 years. The interest rate is 9%, compounded monthly. Find the present value of the debt, rounded to the nearest cent.

(a) \$488.56 (b) \$498.02 (c) \$535.12

(d) \$767.79 (e) \$1309.98 (f) None of the above

4. Solve the equations. Show all of your work. **Solutions by calculator will receive no credit.**

   (a) (10 points) $\log_x(3x - 8) = 1$

$x =$

   (b) (10 points) $\ln(x - 2) + \ln(2x + 1) = \ln(7)$

$x =$

5. (6 points) Express the following as a single logarithm:

$$\frac{1}{3}\ln(x) + 3\ln(x^2) - 3\ln(x - 2) - 3\ln(x - 4)$$

6. Solve the following interest theory questions. Show all of your work.

   (a) (8 points) Suppose \$500 is deposited into an account that earns interest at a rate of 7%, compounded continuously. Find the time t (in years) at which the value of the account is \$900. Round t to two decimal places (e.g. 12.34 years). **Write the formula that you use to calculate t.**

   $t =$ ☐

   (b) (8 points) An investment earns interest at an effective rate of 7%. Find the nominal rate if interest is compounded monthly. Write your answer as a percent rounded to two decimal places (e.g. 12.34%). **Write the formula that you use to calculate the nominal rate.**

   Answer = ☐

   (c) (8 points) A debt of \$800 is due in 8 years. The present value of the debt is \$500. Find the effective rate of interest r. Write r as a percent rounded to two decimal places (e.g. 12.34%). **Write the formula that you use to calculate r.**

   $r =$ ☐

Scrap work

Some Useful Formulas

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

$$S = Pe^{rt}$$

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

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

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

$$r_e = e^r - 1$$

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

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

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

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

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

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