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.

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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.

$$f(x) = (4x - 3)^2$$

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) Solve for $x$ in the equation below.

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

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

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

(b) (10 points) For both of the following parts, consider the function

$$h(x) = 2x^2 + 3x - 2$$

i. The vertex is

(a) $(-1.5, -2)$  (b) $(-0.75, -3.125)$  (c) $(-0.333, -2.778)$

(d) $(1.5, 7)$  (e) $(0.75, 1.375)$  (f) $(0.333, 0.778)$

(g) None of the above

ii. Find all $x$-intercepts. You may need to circle more than one

(a) $-4$  (b) $-2$  (c) $-0.5$

(d) $4$  (e) $2$  (f) $0.5$

(g) 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).

$$t =$$

(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%).

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%).

$$r =$$
Scrap work
Some Useful Formulas

\[ S = P (1 + r)^n \]

\[ S = Pe^{rt} \]

\[ P = S (1 + r)^{-n} \]

\[ P = Se^{-rt} \]

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

\[ r_e = e^r - 1 \]

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

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

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

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