Professor Peter A. Rejto

Name (Print): _____   Student ID number:_____

Section number: _____   Name of TA: _____

Signature:_____

7 pages. Show all work. No work no credit. No books/notes. Calculators: Scientific calculator are allowed. However, graphing calculators are not allowed. More specificaly, calculators that display two or more lines are not allowed.

Additional Information:

1. If your answer involves one or more symbols, please define them. If you have an answer, there is no need to write it as a decimal number.

2. Let f and g be two given functions such that,

$$g(f(x)) = x, \text{for every x in the domain of f}$$

and

$$f(g(y)) = y, \ \text{ for every y in the domain of g}$$

Then, f and g are inverses to each other with respect to the operation of composition. In symbols:
$$g = f^{-1}.$$

1. (20 pts.)

   (a) (10 pts.) Solve the quadratic equation,

   $$x^2 + bx - 1 = 0.$$

   (b) (10 pts.) Derive, from first principles, the solution formula for the quadratic equation of part (a).

2. (20 pts.)

    (a) (5 pts.) Suppose that you deposit \$100.00 into a savings account which pays 5% interest compounded annually. What is your balance after 1 year?

    (b) (5 pts.) Suppose that you deposit \$P(0) into a savings account which pays r% interest compounded annually. What is your balance after 1 year?

    (c) (5 pts.) Suppose that you deposit \$P(0) into a savings account which pays r% interest compounded semi annually. In other words, it is compounded 2 times a year. What is your balance after 1 year?

    (d) (5 pts.) Suppose that you deposit \$P(0) into a savings account which pays r% interest compounded daily. In other words, it is compounded 365 times a year. What is your balance after 2 years?

3. (15 pts.) Let
$$f(x) = |x - 2| \text{ and } g(x) = -x + 4.$$

Find
$$(f \circ g)(1).$$

4. (15 pts.) Let
$$\log_b 3 \sim 0.5646 \text{ and } \log_b 5 \sim 0.08271$$

Find the approximate value of $75^{\frac{1}{3}}$. Note, there is no need to write the resulting fraction as a decimal.

5. (15 pts.)

   (a) (7 pts.) Write 5^{-3} as a fraction.

   (b) (8 pts.) Find,

$$\log_5\left(\frac{1}{125}\right).$$

   Hint: Define,

$$f(x) = 5^x$$

   and

$$g(y) = \log_5(y).$$

   Then, the functions f and g are inverses to each other in the sense of the definiton of page 1.

6. (15 pts.) Let

$$f(x) = x^2 - x - 9, \ \ for \ \ x \geq \frac{1}{2}.$$

(a) (7 pts.) Solve this equation for x in terms of $f(x)$. In other words, assume that $f(x)$ is given and solve the resulting quadratic equation for x.

(b) (8 pts.) Find $f^{-1}(x)$. Note: This part of the problem is similar to, but different, from the ones of Section 3.4.