7 pages. Show all work. No work no credit. No books/notes. Calculators: Scientific calculator are allowed. However, graphing calculators are not allowed. More specifically, 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,

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

and

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

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 \( f(x) = |x - 2| \) and \( g(x) = -x + 4 \).

Find 

\[ (f \circ g)(1). \]
4. (15 pts.) Let

\[ \log_3 3 \approx 0.5646 \quad \text{and} \quad \log_3 5 \approx 0.08271 \]

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 definition on page 1.
6. (15 pts.) Let

\[ f(x) = x^2 - x - 9, \quad \text{for } x \geq \frac{1}{2}. \]

(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.