BIOE 210 Pretest

1. In this course, the symbol "log" is the natural (base e) logarithm. The common (base 10) logarithm is $\log_{10}$. If $\log(a) = 7$ and $\log(b) = 3$, what is $\log(ab^{-1})$?

2. Remembering that
$$\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$$
evaluate
$$\sum_{k=1}^{n} (3k+2)$$

3. Let $f(y) = \cos(y) + 3y^2$. What is $f(x^3 + 1)$?

4. A projectile moves at a speed of 45 mph at an angle of $30°$ above the horizontal. What is the magnitude of the horizontal component of the projectile's velocity?

5. Let $u(x, y) = xy + 3x + \sin(y)$. What is $\dfrac{\partial u}{\partial y}$ evaluated at $(x, y) = (3, 4)$?

6. Line AB has slope 3. What is the slope of a line perpendicular to AB?

7. Duncan purchased two pencils and three pens for seven dollars. The next day he purchased six pencils and one pen for five dollars. Assuming the prices did not change overnight, what is the price of one pencil or one pen?

8. Write a 2nd-order Taylor Series centered at $x = \pi$ that approximates the function
$$f(x) = 3x^2 + \cos x$$

9. Define the following sets:

    (a) The natural numbers.
    (b) The integers.
    (c) The rational numbers.
    (d) The real numbers.

10. A right triangle has sides of length a and $2a$. What is the length of the hypotenuse?