

**Math 162****Quiz 5**

20 points possible

1. (10 pts.) The percentage of new material that a student will retain after studying for  $x$  hours can be modeled as

$$P(x) = \frac{45}{1 + 5.94e^{-0.969x}} \text{ percent.}$$

(a) Give the slope formula for  $P(x)$ . (No units required.) (This formula gives the rate at which the student is retaining new material.)

(b) Find the rate of change of  $P$  when  $x = 3$  hours. (Give correct units.)

(c) Find the second derivative  $P''(x)$ . (No units required.)

(d) Set the second derivative equal to 0 and solve for  $x$ . This gives the time when the rate at which the student is retaining new material is maximum.

(e) The point you found in part (d) is the “point of diminishing returns.” Studying beyond that point will improve the student’s knowledge, but not as quickly. In other words, beyond the inflection point, you gain fewer percentage points per hour than you gain at the inflection point. Apply this to your own life: for your final exams, how long should your study sessions be, between breaks? (Note: regardless of your answer, you’ll get full credit for part (e).)

**2.** (5 pts.) Find the general antiderivative.

$$\int [8.9(0.64)^x + 7] dx$$

**3.** (5 pts.) Find the general antiderivative.

$$\int \left( 8^x + \frac{5}{x^4} \right) dx$$