Honors Brief Calculus **Unit 16 Group Work** Name_____

1. **NO CALCULATOR** Calculate, by hand, the average value of $f(x) = 9 - x^2$, over $[-3, 3]$.

2. A car drives down a road in such a way that its velocity (in m/s) at time t (seconds) is $v(t) = 5t^{1/2} + 3$. Find the car's average velocity (in m/s) between $t = 4$ and $t = 12$.

3. In a certain city the temperature (in degrees Fahrenheit) t hours after 9:00 A.M. was approximated by the function $T(t) = 60 + 15\sin\left(\frac{\pi t}{12}\right)$.

   a) Determine the temperature at 9:00 A.M.

   b) Determine the temperature at 5:00 P.M.

   c) Find the average temperature during the period from 9:00 A.M. to 9:00 P.M.

4. At a theater ticket counter, customers arrive at a rate of 120 per hour. What is the probability that 30 or fewer arrive in a period of 20 minutes?
   Assume this experiment follows a Poisson distribution.

5. **Frequency of Tornadoes**: From past data it has been shown that the number of tornadoes hitting the Midwest each year is a random variable whose probability function can be approximated by a Poisson probability function with $np = 7$. Find the following:

   a) The probability that, in a given year, fewer than five tornadoes will hit the Midwest.

   b) The probability that, in a given year, no more than seven tornadoes will hit the area.

   c) The probability that, in a given year, more than three tornadoes will hit the area.

6. Determine the constant k that will make $f(x) = \frac{1}{(x+1)^3}$ a probability density function over the interval $[3, 7]$.

7. Compute the expected value for the probability density function $f(x) = \frac{4}{3(x+1)^2}$ over the interval $[0, 3]$

8. The following probability density function describes a continuous random variable X.
   $f(x) = \frac{6}{27}(3x - x^2)$ over $[0, 3]$.

   a) Find the probability that X is greater than 1.

   b) Find the probability that X is less than 1.5.