

Name: _____ / 20

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. Show all work for full credit.

1. **[8 points]** A girl flies a kite at a height of 300 ft. A wind blows the kite horizontally at a rate of 20 ft/sec. How fast must she let out the string for the kite when the kite is 500 ft away from her?

2. **[5 points]**

a. Compute the linear approximation of $f(x) = 1/x$ at $x = 10$.

b. Use your answer above to find a decimal approximation for $1/9$.

3. [8 points] A population of bacteria is growing exponentially. At time $t = 0$ minutes there are 400 bacteria. At time $t = 30$ minutes there are 900 bacteria. Find an expression for $P(t)$, the population of the bacteria at any time t . Your expression must be such that if you know the time t and you have a calculator, then you can compute the number $P(t)$.
4. [4 points] The volume of a cone is given by $V = \frac{1}{3}\pi r^2 h$ where r is the radius of the base of the cone and h is the height of the cone. Use a differential to estimate the change in volume of the cone if the height is fixed at 6 feet and the radius changes from 5 feet to 5.5 feet.