1. Use a linearization to approximate $e^{0.5}$. Is it an overestimate or an underestimate?

2. Imagine that you increase the dimensions of a square with side $x_1$ to a square with side length $x_2$ by adding a rectangular strip of width $(x_2 - x_1)$ to the top and right hand side of the square. The change in the area of the square, $\Delta A$, is approximated by the differential $dA$.

   (a) Find $dA$

   (b) Is $dA$ and overestimate or an underestimate for $\Delta A$?

3. A streetlight is mounted at the top of a pole. A man walks away from the pole. How are the rate at which he walks away from the pole and the rate at which his shadow grows related?

   (a) One is a constant multiple of the other.

   (b) They are equal.

   (c) It depends also on how close the man is to the pole.

4. A spotlight installed in the ground shines on a wall. A woman stands between the light and the wall casting a shadow on the wall. How are the rate at which she walks away from the light and rate at which her shadow grows related?
(a) One is a constant multiple of the other.
(b) They are equal.
(c) It depends also on how close the woman is to the pole.

5. [P] A boat is drawn close to a dock by pulling in a rope as shown.

(a) How is the rate at which the rope is pulled in related to the rate at which the boat approaches the dock?
   i. One is a constant multiple of the other.
   ii. They are equal.
   iii. It depends on how close the boat is to the dock.
(b) Suppose the boat is drawn to the dock by pulling in the rope at a constant rate. True or False. The closer the boat gets to the dock, the faster it is moving.

6. The error of using the tangent line \( y = f(a) + f'(a)(x - a) \) to approximate \( y = f(x) \) is \( E(x) = f(x) - [f(a) + f'(a)(x - a)] \). Find
   \[
   \lim_{x \to a} \frac{E(x)}{x - a}
   \]

7. Suppose you have two functions \( f \) and \( g \) shown below, and their tangent lines \( L_1 \) and \( L_2 \).

   Use the limit for the error \( E(x) \), computed in the previous problem, to find \( \lim_{x \to a} \frac{f(x)}{g(x)} \).