1) A 13-foot ladder is leaning against a vertical wall (see figure) when Jack begins pulling the foot of the ladder away from the wall at a rate of 0.5ft/s. How fast is the top of the ladder sliding down the wall when the foot of the ladder is 5ft from the wall?
2) Find the derivative of $y = \tan(e^x)$.

3) Find the derivative of $\left((x + 2)(x^2 + 1)\right)^4$
4) Given that \( \cos(y^2) + x = e^y \), find \( \frac{dy}{dx} \).

5) Given that \( y = x^\frac{5}{3} \), find \( \frac{dy}{dx} \).
6) Given that \( g(y) = e^y y^e \), find the derivative of \( g(y) \).

7) Calculate the derivative of \( y = \frac{1}{\log_4(x)} \).
8) A boat sails directly toward a 150-meter skyscraper that stands on the edge of a harbor. The angular size $\theta$ of the building is the angle formed by lines from the top and bottom of the building to the observer (see figure). A particular triangle that might be helpful is also given.

What is the rate of change of the angular size $\frac{d\theta}{dx}$ when the boat is $x = 500m$ from the building?
9) The area of a circle increases at a rate of $1cm^2/s$. How fast is the radius changing when the radius is 2$cm$?
10) Use the graph below to identify the points (if any) on the interval \([a, b]\) at which the function has an absolute maximum value or an absolute minimum value.

11) Find the derivative of \(f(x) = \sin^{-1}(2x)\)
12) Graph the function below, paying particular attention to the critical values and the end behavior.
(On this problem you need not calculate the location of the inflection point(s) precisely)

\[ y = \frac{x}{x^2 + 1} \]
13) Graph the function $y = -x^3 + 9x$. 
14) Graph the function $y = x + 2 \cos(x)$ on $[-2\pi, 2\pi]$.

(On this problem you need not calculate the location of the inflection point(s) precisely)
15) Find positive numbers $x$ and $y$ satisfying the equation $xy = 12$ such that the sum $2x + y$ is as small as possible.
16) Evaluate the limit below.

$$\lim_{x \to \pi} \frac{\cos(x) + 1}{(x - \pi)^2}$$