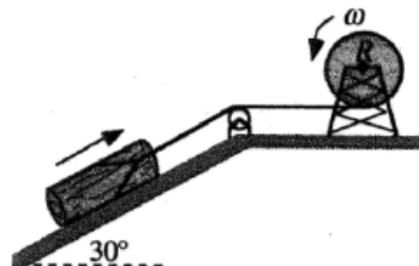


Credit given for work shown.

Problem 1.

A log is lifted into a lumber mill for processing by a power winch which rotates with an angular velocity $\omega = 0.1$ rad/sec. The winch has a radius $R = 0.45$ meters. What is the speed of the log while it is being pulled on the ramp by the winch?



We have learned about linear approximation of f in § 4.1 given by $L(x) = f(a) + f'(a)(x - a)$. When a higher accuracy is needed for a particular problem, then you can extend the linear approximation of f into a quadratic approximation. This requires adding one more term that is related to the second derivative to the linear approximation.

$$Q(x) = \underbrace{f(a) + f'(a)(x - a)}_{\text{Linear Part}} + \underbrace{\frac{f''(a)}{2}(x - a)^2}_{\text{Quadratic Part}}.$$

Problem 2. Consider the function $f(x) = \ln(1 + x)$.

a) Using a calculator, find $\ln(1.1) =$ _____.

b) Determine the linearization of $f(x)$ near 0.

c) Using the linear approximation, estimate $\ln(1.1)$.

d) Determine the quadratic approximation of $f(x)$ near 0.

e) Using the quadratic approximation, estimate $\ln(1.1)$.

(f) Circle one: Which is closer to the actual value? Linear or Quadratic

