Solutions:

1. a) 40 foot-pounds
   b) 200 foot-pounds

2. a) 10,000 foot-pounds
   b) 17,500 foot-pounds
   c) 6875 foot-pounds

3. Differentiate the following functions.
   a) \( f'(x) = 2e^{2x} \).
   b) \( f'(x) = \frac{1}{x} \).
   c) \( h'(x) = -3 \ln(3) \frac{1}{x^2} \).
   d) \( f'(x) = -2^{-4} [\sin(x) + \ln(16) \cos(x)] \).
   e) \( f'(x) = \frac{2}{\sqrt{1-x^4}} \).
   f) \( g'(x) = \frac{6(\tan^{-1}(2x))^2}{1+4x^2} \).
   g) \( f'(x) = \frac{2}{x^3 \ln(4)+\ln(4)} \).

4. Differentiate using logarithmic differentiation.
   a) \( y' = \frac{9}{3x+2} + \frac{20}{4x-5}(3x+2)^3 (4x-5)^5 \).
   b) \( y' = -\sin(x)\ln(x) + \frac{\cos(x)}{x} \cos(x) \).
   c) \( y' = \frac{2\ln(x)}{x} \ln(x) \).
   d) \( y' = \left[ \ln(\ln(x)) + \frac{1}{\ln(x)} \right] (\ln(x))^2 \).

5. A bacterial population starts with 10,000 bacteria and grows at a rate proportional to its size.
   After 2 hours there are 40,000 bacteria.
   a) 320,000
   b) \( t = \frac{2\ln(100)}{\ln(4)} \)
   \( \approx 13.29 \) hours

6. \( t = \frac{5.730 \ln(0.7)}{\ln(2)} \)
   \( \approx 2,948.5 \) years

7. Evaluate the integral for each of the following.