Note: Exam 2 will cover more material than what is listed here and on the other sample test! Study your notes, homework, and textbook to cover all material from Sections 4.1-4.5 and 5.1-5.2

1. Find the Derivative of the function \( f(x) \) \hspace{1cm} (4.1)

\[
f(x) = \frac{4}{\sqrt[3]{x^3}} + 4x
\]

2. Find the Derivative of the function \( g(t) \) \hspace{1cm} (4.1)

\[
g(t) = \frac{t^2 + 3}{t^{1/2}}
\]

3. Find the equation of the line tangent to the curve \( f(x) = x(3 - x^2) \) \hspace{1cm} (4.2)
at the point (2,-2). Use the product rule for the derivative of \( f \).
4. Use the following values to evaluate the derivatives: 
   \( f(a)=6, \quad f'(a)=-8, \quad g(a)=-3, \quad g'(a)=4, \quad h(a)=0, \quad h'(a)=11 \) 
   
   a) Find \( M'(a) \) for \( M(x)=f(x)*g(x) \) 
   
   b) Find \( M'(a) \) for \( M(x)=\frac{h(x)}{g(x)} \) 

5. Find the derivative of \( \frac{\sqrt{t}}{t^2-4} \) 

6. The total number bacteria (in millions) \( t \) hours after the present time is given by the function 
   \( N(t)=5^{2t-4} \). What is the function for the rate of growth of the bacterial population \( (dN/dt) \)? 
   (4.3, 4.4) 

7. Find the derivative of \( g(t) = \log_4(3t) \) 
   (4.3, 4.5)
8. The unit price of calculators is given by \( p(x) = 10 - \sqrt{x} \) where \( p \) is price in dollars and \( x \) is millions of calculators.
   a) Find the revenue function and determine the revenue from producing and selling 4 million calculators

   b) Determine the marginal revenue of producing 4 million calculators

   c) Using this, approximate the revenue from producing 5 million calculators

   d) Write the equation for the tangent line to the revenue curve when 4 million calculators are produced.
9. Find all critical numbers for the following (5.1-5.2)
   a) \( f(x) = x^3 - 12x \)

   b) \( f(x) = \sqrt{x^2 - 4} \)

10. Find the intervals for which the following functions are increasing, decreasing, and find the points for all relative maxima and minima (5.1-5.2)
    a) \( f(x) = x^3 - 3x + 4 \)
b) \( f(x) = \ln x - x \)

11. Determine the \( x \) values for the relative extrema on \( f(x) \) from the graph of \( f'(x) \) below (5.2)