1. Use the chain rule to find the derivative of the function

   (a) \( f(x) = \cot(x) \)
   (b) \( g(t) = \cos(\tan(2x)) \)
   (c) \( h(t) = \cos(\tan(2t)) \)
   (d) \( k(x) = x + (x + \sin^2 x)^4 \)
   (e) \( w(q) = \tan^{-1}(q^3) \)
   (f) \( \ell(x) = \ln(\cot(t^4 + 2t)) \)

2. Find the second derivative of 1a, 1c, and 1e.

3. Find the equation of the tangent line to the curve \( y = \sqrt{1 + x^3} \) at the point \((2, 3)\).

4. For what values of \( r \) does the function \( y = e^{rx} \) satisfy the differential equation \( y'' - 4y' + y = 0 \)?

5. Find \( \frac{dy}{dx} \)

   (a) \( y^2x^3 = \sin(y^2) + x^5 \)
   (b) \( 2(x^2 + y^2)^2 = 25(x^2 - y^2) \)
   (c) \( y = \sqrt{x^x} \)
   (d) \( y = x^{\cos x} \)
   (e) \( y = (\sin x)^{x^2} \)

6. Find all equations of the tangent lines to the curve \( x^3 + y^2 = xy + 3 \) when \( x = 1 \).

7. Solve the following differential equation given that the graph of the solution goes through the point \((8, 3)\)

\[
\frac{dy}{dx} = \frac{x}{8}
\]