The following trigonometric identities are given for reference.
\[
\tan x = \frac{\sin x}{\cos x}, \quad \cot x = \frac{\cos x}{\sin x}, \quad \sec x = \frac{1}{\cos x}, \quad \csc x = \frac{1}{\sin x}.
\]

1. [4 Points] Let \( g \) be a function defined on an interval that includes the number \( x \). State the definition of the derivative of \( g \) at \( x \).

2. [33 Points] (3 points per part) Find the derivatives of the following functions. Express each answer in as simple a form as you can, using correct notation, of course.
   (a) \( a(x) = \sin(x) \)
   (b) \( b(x) = \tan(x) \)
   (c) \( c(x) = \sec(x) \).
   (d) \( d(t) = \cos(t) \)
   (e) \( E(t) = \cot(t) \)
   (f) \( f(u) = \csc(u) \)
   (g) \( g(r) = 2^r \)
   (h) \( y = x^e \)
   (i) \( z = \log x \). Here \( \log x \) denotes \( \log_{10}(x) \).
   (j) \( \theta = \arcsin y \)
   (k) \( K(w) = \arctan w \)

3. [35 Points] (7 points per part) Find the derivatives of the following functions. You may leave your answers unsimplified. As usual, use correct notation.
   (a) \( p(x) = 7x^4 - 6x^3 - 5x^2 + 1 \)
   (b) \( y = \sqrt{x^7} - \frac{2}{\sqrt{x^3}} + \frac{1}{x^4} \)
   (c) \( u = e^{2t+3} \cos(4t) \)
   (d) \( Q(t) = \sin^2(\ln(3t)) \)
   (e) \( z = \frac{\arctan x}{1 + x^2} \)

4. [28 Points] (7 points per part) Find the derivative \( y' = \frac{dy}{dx} \) in each case. Simplify your answers as much as possible. (Sometimes, perhaps, it may be to your advantage to simplify the function first.)
   (a) \( y = \frac{x^3 - 4x^2}{x^2 + 5} \)
   (b) \( y = \frac{x^3}{4}(3 \ln x - 1) \)
   (c) \( y = \ln\left(\frac{1}{\cos x}\right) \)
   (d) \( y = \tan(\arctan(x^3)) + \sec(x + y) \)