1. Let \( y = 2x^3 - \sec(\pi x) + \sqrt{x} \). If \( x \) changes from 1 to 1.035, approximately how much does \( y \) change?

2. Find the indicated derivative of the given functions.

   (a) \( D_x (\tan(4x^2 + 5x - 1)\cos^2(3x)) \)  (Do not bother to simplify!)

   (b) \( \frac{d}{dx} \left( \frac{x^4 - 3x^2 + 1}{x^3 - \sqrt{x}} \right)^5 \) (Do not bother to simplify!)

   (c) \( f'(1) \) if \( f(x) = (2x - \frac{1}{x})^3 (4x^3 - 2)^4 \)

   (d) \( \frac{dy}{dx} \) given \( 2x^4 y + y^3 = 2x^2 - 6x \)

   (e) \( f'''(x) \) for \( f(x) = (3x - 4)^{\frac{2}{3}} \)

3. A metal rod has the shape of a right circular cylinder. As it is being heated, its length is increasing at a rate of 0.005 cm/min and its radius is increasing at 0.001 cm/min. At what rate is the volume changing when the rod has length 40 cm and radius 1.5 cm?

4. A softball diamond has the shape of a square with sides 40 ft. long. If a player is running from second base to third base at a speed of 20 ft/sec, at what rate is her distance from home plate changing when she is 30 ft from third base?
5. For \( f(x) = \frac{x}{1+x^2} \), answer the following questions.
   
   (a) Where is \( f(x) \) increasing? Where is it decreasing?

   (b) Find all local min and max **point(s)**.

   (c) Where is \( f(x) \) concave up? Where is it concave down?

   (d) Find all x-values of inflection point(s).

   (e) Identify all critical **points** on the closed interval [-2, 2].

   (f) Sketch the whole graph of the function using all this information.

6. Show that for a rectangle of given perimeter K, it has maximum area when it is a square.