1. Differentiate. Do not simplify!

(a) \( y = 4x^5 - 5\sqrt{x} + 2x - \frac{4}{x^2} + 8 \)

(b) \( y = (3x^2 + \sqrt{x})(x^4 - x + 1) \)

(c) \( y = \frac{5x^4 - x - 1}{4x^2 + 3} \)

(d) \( y = 4(5x^4 - 7x^2 + 5x)^8 \)

(e) \( y = -2(5 \ln x + \cos x)^5 \)
(f) \( y = \ln((4x^3 - 5x^2 + 9)^2) \)
(g) \( y = x^3 \cdot \sqrt{\csc(x^2)} \)

(h) \( y = e^{(\sqrt[3]{x} + x - 2)} \)

(i) \( y = \sin^3(2x) \tan^5(4x - 1) \)

(j) \( y = e^{x^3} \ln(2x^3 + x - 1) \)

2. Write an equation of the line tangent to the curve \( f(x) = 4x^2 - 3x + 1 \) at \( x = -2 \).
3. Differentiate and simplify.

(a) \[ y = (3x^3 + 1)^6(4x^3 + 7x - 1)^8 \]

(b) \[ y = \frac{(2x^2 + 5)^3}{(1 - 3x)^2} \]

4. Use the limit-definition of derivatives, \( f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} \), to find \( f'(x) \).

\[ f(x) = -2x^2 + 3x + 1 \]
5. Use implicit differentiation to find $\frac{dy}{dx}$.

(a) $x^2 y^3 - 2(x^2 + 5y)^4 + 3x = \ln y$

(b) $4\sqrt{y} - \sec^2\left(\frac{x}{y}\right) + 3 = 0$

6. A spotlight on the ground shines on a wall 12 meters away. If a man 2 m tall walks from the spotlight toward the building at a speed of 1.6 m/s, how fast is the length of his shadow on the building decreasing when he is 4 m from the building?