

AP Calculus AB Related Rates and Implicit Differentiation Review Problem Set

1. A 13-ft ladder is leaning against a wall. If the top of the ladder slips down the wall at a rate of 2 ft/sec, how fast will the foot be moving away from the wall when the top is 5 ft above the ground?
2. A stone dropped into a pond sends out a circular ripple whose radius increases at a constant rate 3 ft/sec. How rapidly is the area enclosed by the ripple increasing at the end of 10 sec?

3. A conical water tank with vertex down has a radius of 10 ft at the top and is 24 ft high. If water flows into the tank at a rate of $20 \text{ ft}^3/\text{min}$, how fast is the depth of the water increasing when the water is 16 ft deep?

4. A man 6 ft tall is walking at the rate of 3 ft/sec toward a streetlight 18 ft high. (a) At what rate is his shadow length changing? (b) How fast is the tip of his shadow moving?

5. Find $\frac{dy}{dx}$ by implicit differentiation:

a. $x^2 - y^3 = xy$

b. $\sin x \cos y = \tan y$

6. Find the equation of the tangent line to the graph of $x + y + xy = 3$ at the point $(1,1)$:

7. Find $\frac{d^2y}{dx^2}$ by implicit differentiation:

a. $2x^2 - 3y^2 = 4$

b. $xy + y^2 = 2$

8. Find the points on the curve $2(x^2 + y^2)^2 = 25(x^2 - y^2)$ where the tangent is horizontal.