

1. Find the derivative of the following functions.

(a) $f(x) = (x + 1)^3(x - 2)^2$

(b) $g(x) = \frac{4 \ln x}{3x}$.

(c) $h(x) = \log_3 \sqrt{x}$.

(d) $i(x) = \sqrt{\frac{x - 3}{x}}$.

(e) $F(x) = xe^{3x}$.

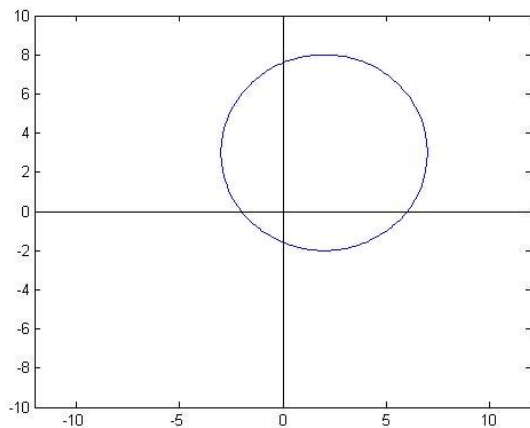
(f) $G(x) = \frac{5^x}{e^x - 1}$.

(g) $H(x) = \ln \left(\frac{x^2}{3x + 2} \right)$.

(h) $I(x) = (\log_5 x)^4$.

2. Use implicit differentiation to find $\frac{dy}{dx}$ if $4x^3 - 3xy + 7y^3 = 0$.

3. The graph of the equation $(x - 2)^2 + (y - 3)^2 = 25$ is a circle of radius 5 centered at the point $(2, 3)$ (see the graph below). Find the equation of the line tangent to this circle at the point $(-1, -1)$, and draw it on the graph of the circle given.



4. Determine $\frac{dx}{dt}$ for $5x^2 + \sqrt{y} = 6xy$ given that $x = 1$, $y = 1$, and $\frac{dy}{dt} = 2$.

5. A square metal plate is expanding because it is being heated. The length of each side is increasing at a rate of 0.2 millimeters per minute. At what rate is the area of the plate increasing when each side is 500 millimeters?

6. Let $f(x) = \frac{1}{3}x^3 - \frac{3}{2}x^2 - 10x + 4$.

(a) Identify the critical values of f .

(b) Find the interval(s) on which f is increasing/decreasing.

(c) Find the x and y values of any local extrema. Write your answer as ordered pairs, and identify each extrema as a maximum or a minimum.

7. Let $f(x) = x \cdot \ln(4x) - 2x^2$.

(a) Write the domain of f in interval notation.

(b) Find $f'(x)$ and $f''(x)$.

(c) Find the interval(s) on which f is concave up/down.

(d) Find any inflection point(s). Write your answer as ordered pair(s).