What you'll Learn About
How to find local maxima and minima from the first derivative

Local Extrema

Determine the local extrema of the function

24) $f(x) = 5x^2 + 6x - 4$

$\boxed{f'(x) = 10x + 6}$

$0 = 10x + 6$

C.P. $x = -\frac{6}{10} = -\frac{3}{5}$

$-\frac{3}{5}$

$(-\infty, -\frac{3}{5})$ $f'(-1) = -4 < 0$
$f(x)$ is dec

$(-\frac{3}{5}, \infty)$ $f'(0) = 6 > 0$
$f(x)$ is inc

$x = -\frac{3}{5}$ Local min b/c
$f'$ changes sign from neg to pos

27) $f(x) = 3x^4 + 8x^3 - 6x^2 - 24x$

$\boxed{f'(x) = 12x^3 + 24x^2 - 12x - 24}$

$0 = (12x^3 + 24x^2) - 12x - 24$

$0 = 12x^2(x + 2) - 12(x + 2)$

$0 = (x+2)(12x^2 - 12)$

$x = -2$  $x = \pm 1$

$-2$  $-1$  $1$

$(-\infty, -2)$ $f'(-3) = -96 < 0$
$f(x)$ dec

$(-2, -1)$ $f'(-1.5) = 7.5 > 0$
$f(x)$ inc

$(-1, 1)$ $f'(0) = -24 < 0$
$f(x)$ dec

$(1, \infty)$ $f'(2) = 144 > 0$
$f(x)$ inc

$x = -2$ Local min b/c $f'$ changes from neg to pos
$x = 1$



$x = -1$ Local Max b/c changes from pos to neg

Determine the local extrema of the function

33) $f(x) = x^4 - 4x^{3/2}$

$$f(x) = x^4 - 4x^{3/2} \rightarrow x^4 - 4\sqrt{x^3}$$

$x \geq 0$

$$\boxed{f'(x) = 4x^3 - 6x^{1/2}} \quad \boxed{4x^3 - 6\sqrt{x}}$$

$\frac{dy}{dx} = 0$ $\qquad$ $\frac{dy}{dx}$ und $\quad x < 0$

$0 = 4x^3 - 6x^{1/2}$

$0 = 2x^{1/2}(2x^{5/2} - 3)$ $\qquad$ $2x^{5/2} - 3 = 0$

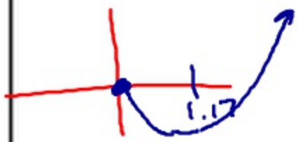
$2x^{5/2} = 3$

$2x^{1/2} = 0$ $\qquad$ $(x^{5/2})^{2/5} = \left(\frac{3}{2}\right)^{2/5}$ $\qquad$ $x = \left(\frac{3}{2}\right)^{2/5} = 1.176$

$x = 0$

$x = (1.5)^{.4}$ Local Min b/c $f'$ changes from neg to pos

36) $f(x) = x^{-2} - 4x^{-1}$ $\quad x > 0$




$(-\infty, 0)$ $f'(-1)$ und

$\left(0, \left(\frac{3}{2}\right)^{2/5}\right)$ $\boxed{f'(1) = -2 < 0}$

$\left(\left(\frac{3}{2}\right)^{2/5}, \infty\right)$ $f'(4) = 244 > 0$

$x = 0$ Local Max b/c $f' < 0$ from $(0, 1.5^{.4}$