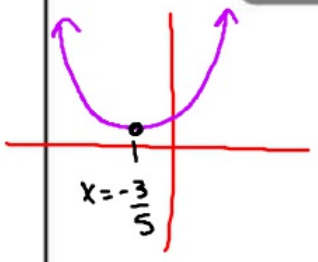
What you'll Learn About
How to find local maxima and minima from the first derivative



Determine the local extrema of the function

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

$f'(x)=10x+6$

$0=10x+6$

$\frac{-6}{10}=\frac{10x}{10}$

$\frac{-6}{10}=x$

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

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

C.P.

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

C.P.

$\frac{-3}{5}=x$ is a local min b/c $f'(x)$ changes sign from neg to pos

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

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

$0=12x^3+24x^2-12x-24$ ✓

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

$0=12(x+2)(x^2-1)$

C.P: $x=-2$ $x=\pm 1$

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

$x=1$ local max b/c f' changes sign from pos to neg

$f'(-3)=12(-1)(8)<0$ $f(x)$ dec $(-\infty,-2)$

$f'(-1.5)=12(.5)(1.25)>0$ $f(x)$ inc $(-2,-1)$

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

$f'(2)=12(4)(3)>0$ $f(x)$ inc $(1,\infty)$

Determine the local extrema of the function

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

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

$[0,\infty]$

$4x^3-6\sqrt{x}$ ←

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

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

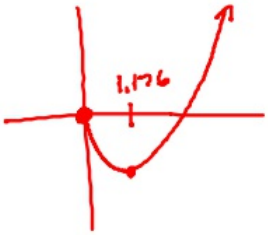
$2x^{1/2}=0 \qquad 2x^{5/2}-3=0$

$x=0$ local max

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

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

local min → $x=\left(\frac{3}{2}\right)^{2/5}=1.176$



$f'(-1)=$ UND

$f'(1)=-2<0$

$f'(4)=256-12>0$

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

What you'll Learn About
How to find intervals of concavity
How to find local extrema using the second derivative

Determine the intervals of concavity and the inflection points

↑ where concavity changes

A) $y = x^2$

concave up $(-\infty, \infty)$

$y = x^2$
$y' = 2x$
$y'' = 2 > 0$

B) $y = -x^2$

concave down $(-\infty, \infty)$

$y = -x^2$
$y' = -2x$
$y'' = -2 < 0$

5) $f(x) = 10x^3 - x^5$

$f'(x) = 30x^2 - 5x^4$

$f''(x) = 60x - 20x^3$

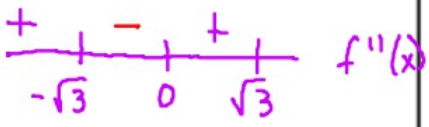
$0 = 60x - 20x^3$

$0 = 20x(3 - x^2)$

$x = 0 \quad x = \pm\sqrt{3}$

Possible Inflection Points (P.I.P.S.)

These are inflection points b/c f'' changes sign



$f''(-2) = -40(-1) > 0$
f concave up $(-\infty, -\sqrt{3})$

$f''(-1) = -20(2) < 0$
f concave down $(-\sqrt{3}, 0)$

$f''(1) = 20(2) > 0$
f concave up $(0, \sqrt{3})$

$f(2) = 40(-1) < 0$
f concave down $(\sqrt{3}, \infty)$