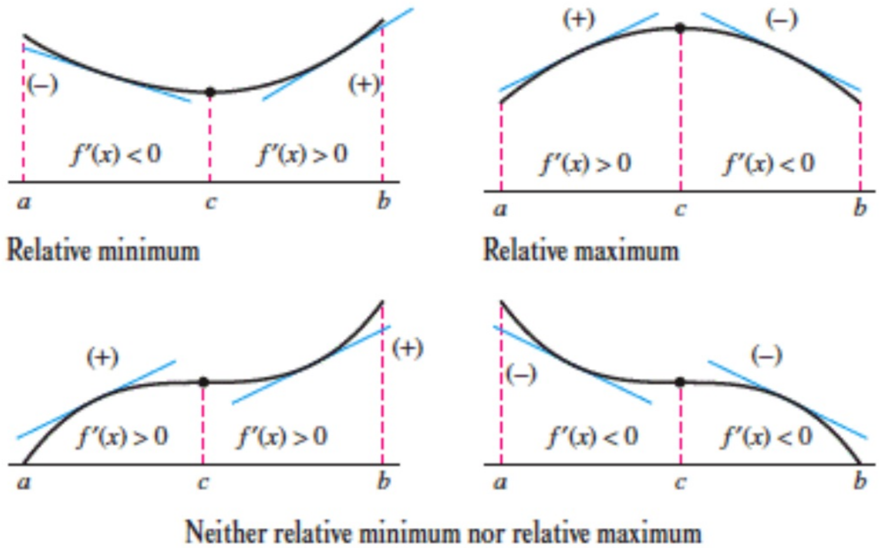


Finding relative extrema using the First Derivative Test

#1 Find the relative extrema. Justify your answer.

$f(x)=x^3 - 6x^2$

points

$D: (-\infty, \infty)$

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

$0 = 3x(x-4)$

$x = 0, 4$

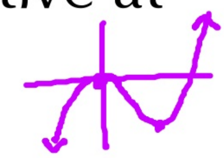
+ − +

0 4

rel. max $(0,0)$

rel. min $(4,-32)$

F has a rel. max at (0,0) because f' changes from positive to negative at this point.



F has a rel. min at (4,-32) because f' changes from negative to positive at this point.

Find all relative extrema.

#2 $$f(x) = \frac{x^2 - 3x - 4}{x - 2}$$

$D: \{x \mid x \neq 2\}$

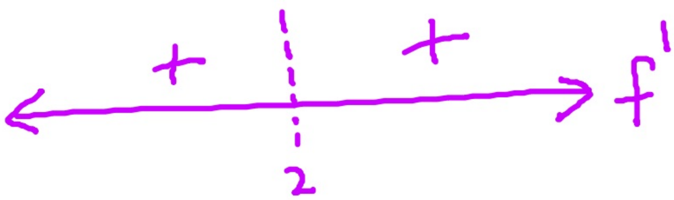
$$f'(x) = \frac{x^2 - 4x + 10}{(x-2)^2}$$

$$0 = x^2 - 4x + 10$$

$$\frac{4 \pm \sqrt{16 - 4(1)(10)}}{2(1)}$$

$$4 \pm \sqrt{-}$$

no critical numbers



No relative extrema.
f(x) is increasing everywhere except $x = 2$

#3 Find the x-values of the relative extrema on the interval (0, 2pi) y = sinxcosx

$$y' = \cos^2 x - \sin^2 x$$

$$0 = \cos^2 x - \sin^2 x$$

$$0 = (\cos 2x)$$

$$\cos A = 0$$

$$A = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \frac{7\pi}{2}$$

$$2x =$$

$$x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$$

$$\frac{\sin^2 x}{\cos^2 x} = \frac{\cancel{\cos^2 x}}{\cancel{\cos^2 x}}$$

$$\sqrt{\tan^2 x} = \sqrt{1}$$

$$\tan x = \pm 1$$

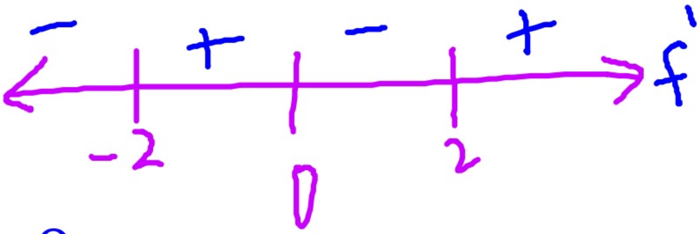
0	+	$\frac{\pi}{4}$	−	$\frac{3\pi}{4}$	+	$\frac{5\pi}{4}$	−	$\frac{7\pi}{4}$	+	2π
		rel. max		rel. min		rel. max		rel. min		

#4 $f(x) = (x^2-4)^{2/3}$ D: $(-\infty,\infty)$

Find the x-coordinates of the relative extrema.

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

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

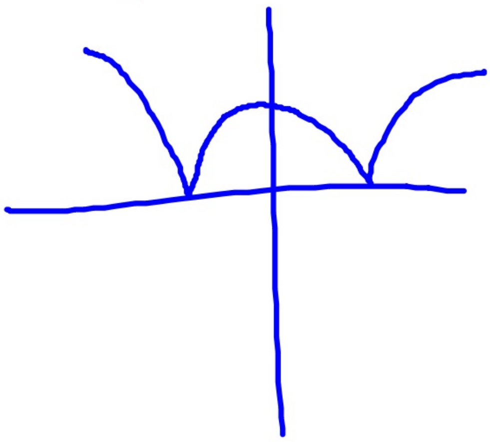


$x=0$

$x=\pm 2$

rel. max: x = 0

rel. min: x = 2, -2



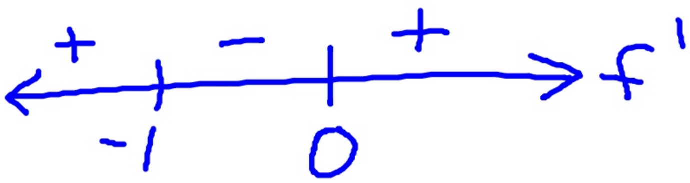
#5

$$f(x) = \begin{cases} 2x+1, & x \le -1 \\ x^2 - 2, & x > -1 \end{cases}$$

Put critical numbers and "where f(x) switches to the other function"

$$f'(x) = \begin{cases} 2 & , x < -1 \\ 2x & x > -1 \end{cases}$$

Relative max at (-1,-1) because f' changes from positive to negative at this point



Relative min at (0,-2) because f' changes from negative to positive at this point