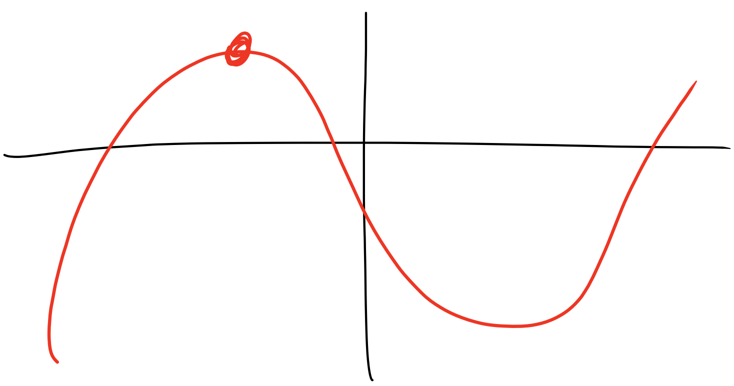
$$\int x^n \, dx = \frac{1}{n+1} x^{n+1} + C \quad \text{when } n \neq -1$$

$$\int x^{-1} \, dx \quad \text{or} \quad \int \frac{1}{x} \, dx$$

$$= \ln|x| + C$$



$$f(x) = (3-2x)e^{5x} \qquad \text{find rel extrema}$$

$$f'(x) = (3-2x) \cdot e^{5x} \cdot 5 + e^{5x} \cdot -2$$

$$= e^{5x}\left((3-2x) \cdot 5 + -2 \right)$$

$$= e^{5x}\left(15 - 10x - 2 \right)$$

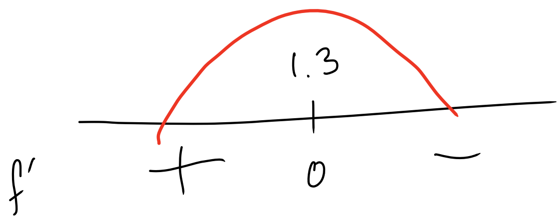
$$\boxed{f'(x) = e^{5x}(13-10x)}$$

$$e^{5x}(13-10x) = 0$$

$\cancel{e^{5x} = 0}$ $\quad 13-10x = 0$

$$13 = 10x$$

$$x = \frac{13}{10} = \boxed{1.3}$$



$\boxed{x = 1.3 \text{ is a rel max}}$

$$f'(0) = e^{5\cdot 0}(13-10\cdot 0) = +$$

$$+ \cdot +$$

$$f'(2) = e^{5\cdot 2}(13-10\cdot 2) = -$$

$$+ \cdot -$$

$\int 8 \cdot 5^{3x}\,dx$ $\qquad \int a^{kx}\,dx = \frac{1}{k\ln a}a^{kx} + C$

$$= 8 \cdot \frac{1}{3\ln 5} 5^{3x} + C$$

$$\int \frac{5}{x^2}\,dx \qquad \int \frac{5}{x} \qquad \int \frac{1}{5x}$$

$$= \qquad = \qquad =$$

$$\int 5x^{-2}\,dx \qquad \int 5x^{-1} \qquad \int \frac{1}{5}x^{-1}$$

$$= \qquad = \qquad =$$

$$5\cdot \frac{1}{-1}x^{-1} + C \qquad 5\cdot \ln|x| + C \qquad \frac{1}{5}\ln|x| + C$$

$$-5x^{-1} + C$$

$$\cancel{\int \frac{5}{x} = \int 5 - x}$$

Find rel extrema using 2nd deriv test

$$f(x) = 2x^3 - 6x + 1$$

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

<u>crit #s</u> $\quad f' = 0: \quad 6x^2 - 6 = 0$

$$x^2 = 1 \qquad x = \pm 1$$

$$\boxed{x = 1, \quad x = -1}$$

$f''(x) = 12x$

$f''(1) = 12 \cdot 1 = 12$ $+$, so 1 is a rel min

$f''(-1) = 12 \cdot -1 = -12$ $-$, so -1 is a rel max.

Sketch: $\dfrac{x}{x^2-4}$

vert 'tote:
vert ass

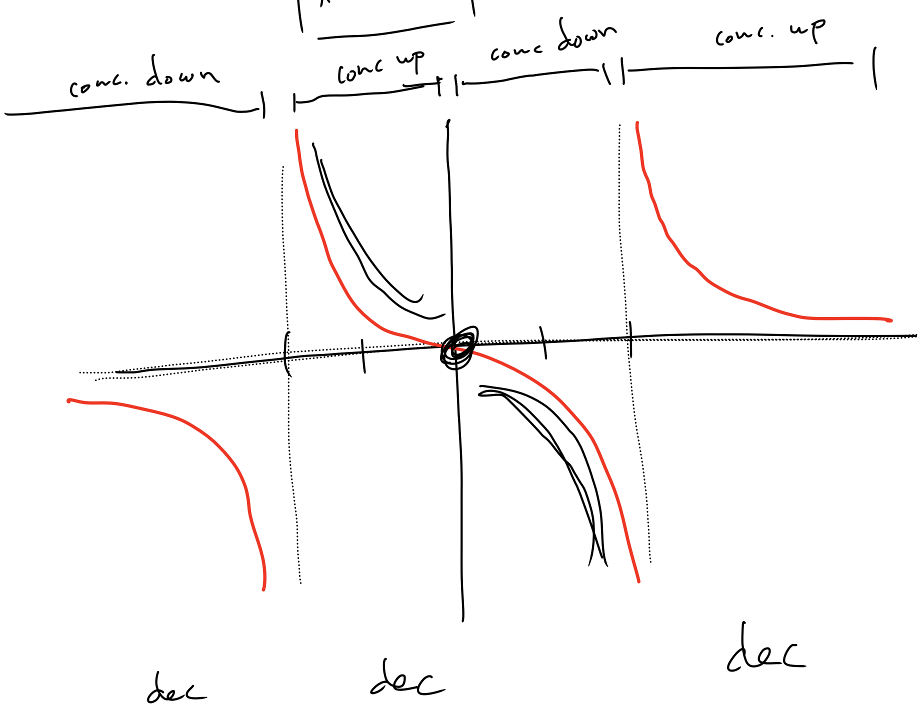
$x^2 - 4 = 0$

$x^2 = 4$

$\boxed{x = \pm 2}$

horz 'tote

$\lim\limits_{x \to \infty} \dfrac{x}{x^2-4} = 0$



down: $(-\infty, -2)$ & $(0, 2)$

up: $(-2, 0)$ & $(2, \infty)$

crit #s $\quad f(x) = \dfrac{x}{x^2-4}$

f': $\dfrac{(x^2-4)\cdot 1 - x\cdot 2x}{(x^2-4)^2}$

$= \dfrac{x^2-4-2x^2}{(x^2-4)^2} = \boxed{\dfrac{-x^2-4}{(x^2-4)^2} = f'(x)}$

$f'=0$: $\dfrac{-x^2-4}{(x^2-4)^2} = 0$

$-x^2-4=0$

$x^2=-4$

no solns

f' DNE: $(x^2-4)^2=0$

$x^2-4=0$

$\boxed{x=\pm 2}$

y-vals of critical #s

only crit #s are ± 2, which are vert 'totes, so no y-vals to plot.

inc/dec

		-2		2	
f'	$-$	DNE	$-$	DNE	$-$

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

f' is always negative

Intervals of concavity for

$$f(x) = x^3 - 7x^2 + 3x + 4$$

$$f'(x) = 3x^2 - 14x + 3$$

$$f''(x) = 6x - 14$$

$f'' = 0$: $\quad 6x - 14 = 0$

$$6x = 14$$

$$x = 14/6 = 7/3$$

$7/3$

f'': $\quad - \quad 0 \quad +$

$$f''(0) = 6 \cdot 0 - 14 = -14$$

$$f''(3) = 6 \cdot 3 - 14 = 4$$

conc. down on $(-\infty, 7/3)$

up on $(7/3, \infty)$.

$x = 7/3$ is an infl. pt.