(13) $f(x) = \dfrac{x^2-5x+4}{x}$, $x \neq 0$

$f'(x) = \dfrac{(2x-5)x - (x^2-5x+4)}{x^2} = \dfrac{x^2-4}{x^2}$ crit #'s 2, -2

$f''(x) = \dfrac{2x(x^2) - (x^2-4)(2x)}{x^4} = \dfrac{8x}{x^4}$ $f'(x)=0$

$f''(2) = \dfrac{8(2)}{2^4} \rightarrow$ pos. $\quad x=2$ min

$f''(-2) = \dfrac{8(-2)}{(-2)^4} \rightarrow$ neg $\quad x=-2$ max

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(15) $f(x) = (x^2+1)^{2/3}$

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

crit #'s $x=0$

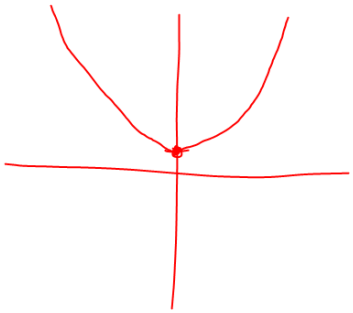
$f'(x)$: $-$ | $+$, 0, min

$f''(x) = \dfrac{4}{3}(x^2+1)^{-1/3} + \dfrac{4x}{3}\left(-\dfrac{1}{3}\right)(x^2+1)^{-4/3}(2x)$

$\dfrac{3(x^2+1)}{3(x^2+1)} \dfrac{4}{3(x^2+1)^{1/3}} - \dfrac{8x^2}{9(x^2+1)^{4/3}}$

$f''(x) = \dfrac{12x^2+12-8x^2}{9(x^2+1)^{4/3}} = \dfrac{4x^2+12}{9(x^2+1)^{4/3}}$ $\Rightarrow$ always concave up

$f(0)=1$



(21) $f(x) = x^{3/4} - 4x^{1/4} = \sqrt[4]{x^3} - 4\sqrt[4]{x}$, $x \geq 0$

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

$f'(x) = \frac{3\sqrt{x} - 4}{4x^{3/4}}$ crit #'s $x = 0, \frac{16}{9}$

$3\sqrt{x} - 4 = 0$

$\sqrt{x} = \frac{4}{3}$

$x = \frac{16}{9}$

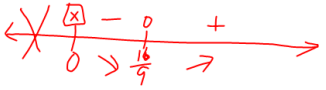
$f''(x) = -\frac{3}{16}x^{-5/4} + \frac{3}{4}x^{-7/4} = \frac{x^{3/4}}{x^{3/4}} \quad \frac{-3}{16x^{3/4}} + \frac{3}{4x^{7/4}} \quad \frac{4}{4}$

$f''(x) = \frac{-3\sqrt{x} + 12}{16x^{7/4}}$, crit #'s $x = 0, 16$

$-3\sqrt{x} + 12 = 0$

$\sqrt{x} = 4$

$x = 16$

$f'(x)$ 

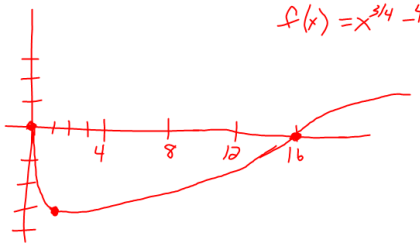
$f''(x)$ 

$f(0) = 0$

$f(\frac{16}{9}) = -3.1$

$f(16) = 0$

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



(17) $f(x) = \frac{x^2}{x^2 - 9}$, $x \neq \pm 3$

horiz asymptote $y = 1$

$\lim_{x \to 3^+} = \infty$

$\lim_{x \to 3^-} = -\infty$

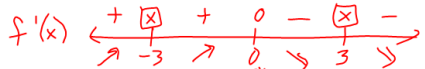
$\lim_{x \to -3^+} = -\infty$

$\lim_{x \to -3^-} = \infty$

$f'(x) = \frac{-18x}{(x^2-9)^2} \Rightarrow$ crit #'s $x = 0$

$f''(x) = \frac{-18(x^2-9)^{\cancel{2}} + (+18x)(2)\cancel{(x^2-9)}(2x)}{(x^2-9)^{\cancel{4}3}} = \frac{54x^2 + 162}{(x^2-9)^3}$

$-18x^2 + 162$ $+72x^2$

$f'(x)$ 

$f''(x)$ 

$f(0) = 0$