

Name Key

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1. For  $f(x) = x^5 - 5x^4 + 3$ , find the intervals on which  $f$  is concave up, and concave down.

$$f'(x) = 5x^4 - 20x^3$$

$$f''(x) = 20x^3 - 60x^2$$

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

$$\boxed{\begin{matrix} \text{CC} \uparrow & x > 3 \\ \downarrow & x < 3 \end{matrix}}$$

b

too easy to mistake CP for PI  
 many get adder, but use CP  
 or get sign wrong

2. Carefully sketch the graph of

$$y = \frac{x-2}{x^3}$$

Give x-y coordinates or equations (if any) of all:

zeros: 2

critical points:  $(3, 1/27)$

Vertical asymptotes:  $x=0$

horizontal asymptotes:  $y=0$

points of inflection:  $(2, 0)$   $(-2, -1/2)$

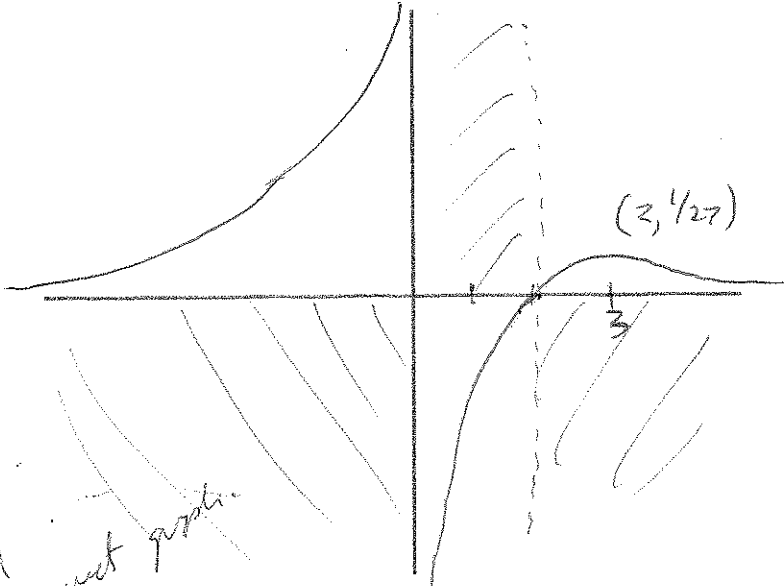
$$\begin{aligned} y' &= \frac{x^3(1) - (x-2)(3x^2)}{x^6} \\ &= \frac{x^3 - 3x^3 + 6x^2}{x^6} \quad \text{trouble} \\ &= \frac{-2x^3 + 6x^2}{x^6} \quad \text{I got all} \\ &= \frac{-2x + 6}{x^4} = \frac{-2(x-3)}{x^4} \end{aligned}$$

C.P.  $x=3$   $(3, 1/27)$

$$\begin{aligned} y'' &= \frac{x^4(-2) - (-2x+6)(4x^3)}{x^8} \\ &= \frac{-2x^4 + 8x^4 - 24x^3}{x^8} \\ &= \frac{6x^4 - 24x^3}{x^8} \\ &= \frac{2x^3(3x-12)}{x^8} \end{aligned}$$

~~$x=4$   $x=3$~~

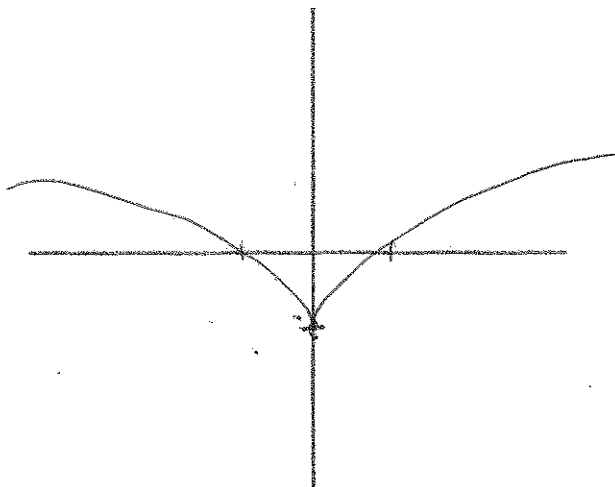
$(1, 2/64)$   $(2, 0)$   $(-2, -1/2)$   
 $(4, 1/32)$



I got all  
 & more correct graphs  
 lots got  
 CP, Amp, etc  
 but drawn all  
 wrong!

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3. Use first and second derivative to graph  $y = x^{4/5} - 1$ .



$$\frac{dy}{dx} = \frac{4}{5} x^{-1/5} = \frac{4}{5x^{1/5}}$$

vert tang at  $x=0$   
 $(0, -1)$

$$\frac{d^2y}{dx^2} = -\frac{4}{25} x^{-6/5} < 0 \text{ all } x$$

$$x^{4/5} = 1$$

$$x^{4/5} = \pm 1$$

$$x = \pm 1$$

I got all