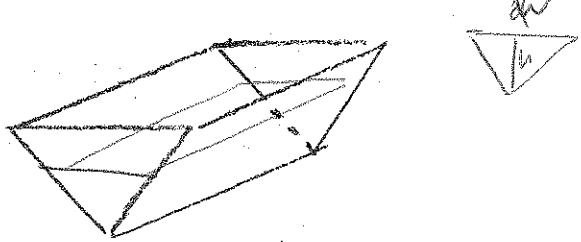


8 1. A ten foot long trough has ends which are triangles 2 feet wide and 2 feet high. Water is entering at the rate of .5 in³/min. At what rate is the water level rising when the water is 1 foot deep?



$$V = \frac{1}{2} wh \cdot 10 = \frac{1}{2} 10 h^2 = 5h^2$$

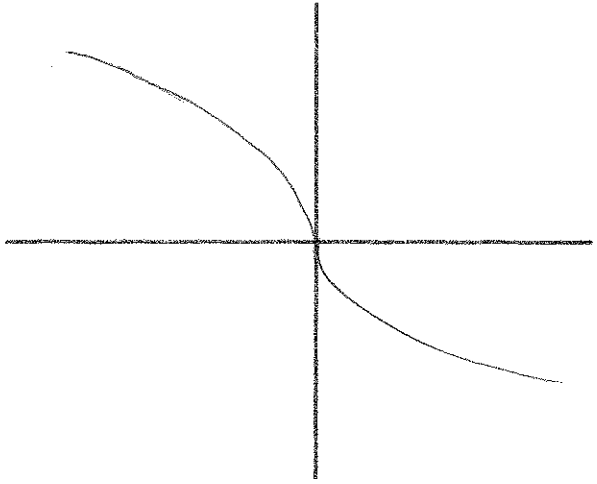
$$\frac{dV}{dt} = 10h \frac{dh}{dt}$$

$$\frac{dV}{dt} = \frac{1}{20} \text{ at } h=1$$

$$.5 = 10(1) \frac{dh}{dt}$$

$$\frac{dh}{dt} = \frac{1}{20} = .05 \text{ in/min.}$$

8 2. Carefully sketch the graph of $y = -2x^{1/5}$.



$$\frac{dy}{dx} = -\frac{2}{5} x^{-4/5}$$

$$= -\frac{2}{5 x^{4/5}} < 0 \text{ all } x$$

dec all x

$$\frac{d^2y}{dx^2} = \frac{8}{25} x^{-9/5} = \frac{8/25}{x^{9/5}} > 0 \text{ } x > 0$$

cc ↑ x > 0
 cc ↓ x < 0

14 3. Carefully sketch the graph of

$$y = \frac{x^3}{(x-1)^3}$$

Give coordinates or equations (and plot) of

zeros: $x=0$

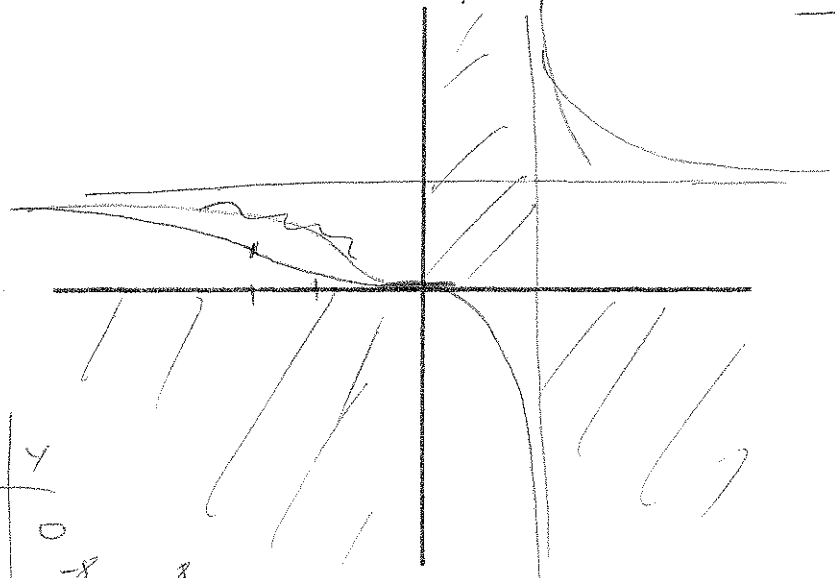
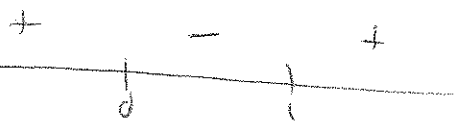
critical points:

Vertical asymptotes: $x=1$

horizontal asymptotes: $y=1$

$$\lim_{x \rightarrow \infty} \frac{x^3}{(x-1)^3} = \left(\frac{x}{x-1}\right)^3 = \left(\frac{1}{1-1/x}\right)^3 \rightarrow 1$$

~~x > 0~~ x > 0
 x < 0



$$\frac{dy}{dx} = \frac{(x-1)^3(3x^2) - x^3(3(x-1)^2)}{(x-1)^6}$$

$$= \frac{3x^2(x-1)^2[x-1-x]}{(x-1)^6}$$

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

c.p. $x=0 \frac{dy}{dx} = 0$

$$\frac{d^2y}{dx^2} = \frac{(x-1)^4(-6x) + (-3x^2)4(x-1)^3}{(x-1)^8}$$

$$= \frac{3x(x-1)^3(2x+4)}{(x-1)^8} = \frac{3x(x-1)^3(-2(x-1)+4x)}{(x-1)^8}$$

x	y
0	0
-2	$\frac{-8}{(-3)^3} = \frac{8}{27}$

ask for P.F.