

3.2-pub-27 determine whether crit no or max or min

$\frac{dy}{dx} = 0$  Second Der  $\left\{ \begin{array}{l} \text{MAX } \wedge \text{ y CONCAVE DOWN, } y'' < 0 \\ \text{y}' \text{ changes } + \text{ to } - \end{array} \right.$

$\frac{dy}{dx} = 0$  MIN  $\left\{ \begin{array}{l} \text{2nd Derivative POS} \\ \text{1st Der } - \text{ to } + \end{array} \right.$

27.  $f(x) = x^3 + 3x^2 + 1$

$\frac{dy}{dx} = 3x^2 + 6x = x(3x+6)$  CR:  $x=0, x=-2$   
 At  $x=-2$   $y'' = -6 < 0$   $\wedge$  REL MAX

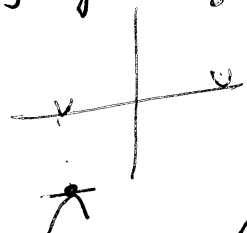
$\frac{d^2}{dx^2} = 6x + 6$   
 At  $x=0$   $y'' = 6 > 0$   $\vee$  REL MIN

Actual Graph

Prob 31  $f(x) = 2x + 1 + \frac{18}{x}$

$\frac{dy}{dx} = 2 - \frac{18}{x^2} ; = 0$  where  $2x^2 = 18, x = \pm 3$   
 $\frac{d^2y}{dx^2} = + \frac{36}{x^3}$  At  $x = -3, y'' < 0$   $\wedge$  REL MAX  
 At  $x = +3, y'' > 0$   $\vee$  REL MIN

"0",  $-3, f(x) = -6 + 1 + \frac{18}{-3} = -11$   
 At  $x = +3 = 6 + 1 + 3 = 10$



What is concavity and how does it change (at  $x=0$ ), SPECIAL PT.

OUTLINE (p224)

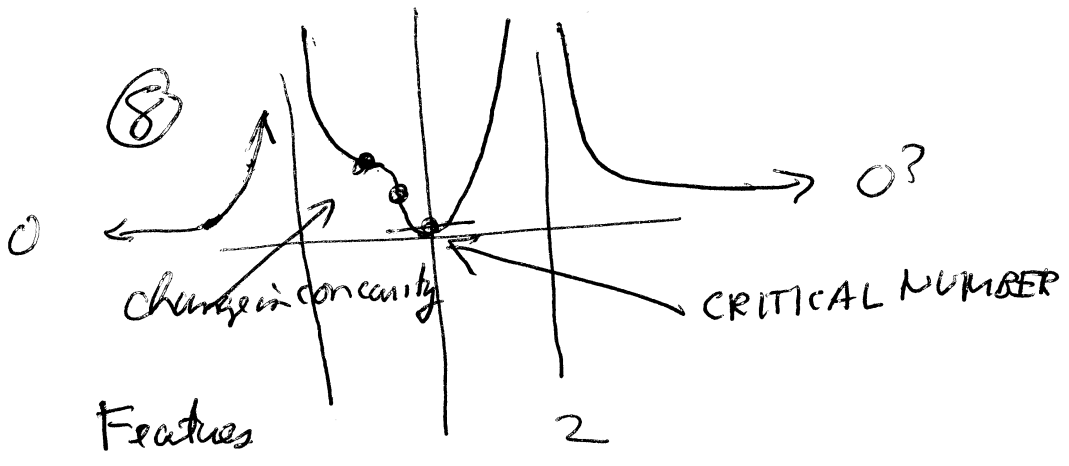
- 1<sup>o</sup> SPECIAL POINTS  $\div 0$ , etc
- 2<sup>o</sup> domain
- 3<sup>o</sup> intercepts (y easy - x is usually what is)
- 4<sup>o</sup> Vert Horiz Asympt [see 0<sup>o</sup>]
- 5<sup>o</sup>  $\frac{dy}{dx}$ ; CRIT NOS  $\rightarrow$  values of  $f$
- 6<sup>o</sup> Extrema calc<sup>o</sup> calculate  $f$
- 7<sup>o</sup>  $f''$  (tander) possible w/ (8) Plot at  $y''=0$
- 8<sup>o</sup> Clean up

3.3.13 6<sup>o</sup> and Asymptote

$y = \frac{t^2 + 3t - 5}{t^2 - 5t + 6}$  Hope for easy, but

$t^2 - 5t + 6 = (t-2)(t-3)$   
 (top not so clean Roots  $t = \frac{-3 \pm \sqrt{9+20}}{2}$ )

$= \frac{t^2 - 5t + 6 + 5t - 6 + 3t - 5}{t^2 - 5t + 6}$   
 $= 1 + \frac{3t - 11}{(t-2)(t-3)}$  (More manageable)



Short Key Test One 2/13/2009

SHOW WORK:- indicated here, but use your judgment!

(M Grade 0/4/8 except in rare instances)

1.  $x^4$ ; some indication using  $x^2+3$ ; if calculate both cond (N.B. says does not exist)

2. 0, 1, -1; should find derivative (4)

3.  $\frac{-1}{x(x+2)}$ ; write down  $\frac{1}{(x+2)}$  etc

4.  $x^2+18$ ; write  $\frac{(x-9)(x+9)}{x-9}$  or variation

5.  $\frac{1}{43}$ ; derivative  $\frac{43}{(t+9)^2}$

6.  $-\frac{4x+y}{x+2y}$ ;  $\rightarrow$  something like  $4x + x \cdot \frac{1}{\text{product rule}}$

7. -1.32 [-1.32471...] Must write method! solve, trace-zero, etc

8.  $y=40x-1$  Taking deriv and plug in slope=40 gives 4

9. POS for  $q=20$  and POS for  $q=40$ ;  $R = p(240 - q) = p(240 - 2q)$   
take derivative somewhere

10.  $+\frac{288}{(4x+3)^2}$ ; First deriv  $-\frac{36}{(4x+3)^2}$  [-4 for missing - on both (or one)]

11.  $\$8324.40$  per hour Ans =  $(0.6q + 0.7)(6t + 80)$   $t=2, q=164$

12. (0,0) and (6,12); derivative  $\frac{x(x-6)}{(x-3)^2}$

13.  $q = 6000 - 2000(p - 6.50)$  [or if work shows  $19000 - 2000p$

Extra credit (up to 8 points): 2 pts for calculating formula

for  $R = p(19000 - 2000p)$  MAX @ 4.75  
total 4 up to here