

## ASSIGNMENT 42

1.  $f''(a) > 0 \rightarrow f$  is CU near  $a \rightarrow$  I not true  
 $f''(a) \neq 0 \rightarrow a$  is not an infl. point  $\rightarrow$  II false  
 (D)  $f'(a) = 0 \rightarrow a$  is a c.p.; since  $f''(a) > 0$   
 $f$  is CU, so  $a$  is a local min.
2. I true, by def. of a critical point  
 II true, since  $f'(a) = \text{slope at } a$   
 (E) III not true (consider  $a=0$  for  $f(x)=x^3$ )
3. FALSE; consider  $f(x) = (x-5)^3$ , i.e., the graph of  $x^3$  moved 5 units to the right; then  $f'(5) = 0$ , but  $x=5$  is not a local extreme
4. TRUE; Fermat's theorem
5. FALSE;  $f(x)$  is continuous for all real numbers, and thus on  $[-2, 7]$ . By the Extreme Value Theorem,  $f(x)$  must have absolute max, and absolute min, in  $[-2, 7]$
6. TRUE (exp. function is stronger than any power of  $x$  at  $\infty$ ; as well,  $x^3 \rightarrow \infty$  as  $x \rightarrow \infty$  so the leading behaviour in the denominator is  $x^3$ )

7.  $m^* = -2$  is an equilibrium (check it)

FALSE  $f(x) = 2x^2 + 6x + 2 \rightarrow f'(x) = 4x + 6$

$$f'(m^*) = 4(-2) + 6 = -2 \rightarrow |f'(m^*)| > 1$$

So unstable

8.  $f'(x)$  is a polynomial of degree 3, so  
FALSE can have at most 3 roots (ie at most  
3 critical points)