

Maybe one problem  
 for today.  
 But some left after  
 15 min.

1. Find all critical points of  $f(x) = 3x^5 - 5x^3 + 6$ .

$$f'(x) = 15x^4 - 15x^2$$

$$= 15x^2(x^2 - 1)$$

$$x = 0$$

$$\Rightarrow x = 1, -1$$

mod 17/20

2. Find the function  $F$  which satisfies  $F'(x) = x^2 + \sin x$ , and  $F(0) = 2$ .

$$F(x) = \frac{x^3}{3} - \cos x + C$$

$$2 = -1 + C$$

$$C = 3$$

$$\frac{x^3}{3} - \cos x + 3$$

3. Find the absolute maximum and minimum values of the function

$$f(x) = 2x^3 - 15x^2 + 36x, \text{ for } 0 \leq x \leq 3.$$

$$6x^2 - 30x + 36$$

$$6(x^2 - 5x + 6)$$

$$(x-3)(x-2)$$

max 28 (at  $x=2$ )

min 0 (at  $x=0$ )

$$f(0) = 0$$

$$f(2) = 2(8) - 15(4) + 72$$

$$= 16 - 60 + 72 = 28$$

$$f(3) = 2(27) - 15(9) + 36(3)$$

$$= 54 - 135 + 108$$

$$= 54 - 27 = 27$$

4. On what intervals are the following functions increasing? and decreasing?

a.  $f(x) = -x^2 - 6x + 1$

$$f'(x) = -2x - 6$$

$$= -2(x+3)$$

$$x = -3$$

$$x < -3 \quad f'(x) > 0$$

$$x > -3 \quad f'(x) < 0$$

Inc  $[-\infty, -3]$

Dec  $[-3, \infty)$

almost  
 all got

b.  $f(x) = x^3 - 3x^2 + 3x - 2$

$$3x^2 - 6x + 3$$

$$3(x^2 - 2x + 1) \quad (x-1)^2$$

$$(x+2)(x-1)$$

$$3(x-3)(x+1)$$

$$\textcircled{1} f' = 3x^2 - 6x + 3 = 0$$

$$x^2 - 2x + 1$$

$$(x-1)^2 \geq 0$$

$$> 0 \quad x \neq 1$$

always  $\nearrow$

c.  $f(x) = x^3$

$$3x^2 \leq 0 \text{ at } x = 0$$

But  $x=0$

$(-\infty, 0)$  Dec

$(0, \infty)$

$$\textcircled{2} 3x^2 - 6x - 9$$

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

$$3(x-3)(x+1)$$

$$x = -1, 3$$

$$\begin{array}{c} \frac{-}{+} \quad \frac{-}{-} \quad \frac{+}{+} \\ \frac{-}{+} \quad \frac{-}{-} \quad \frac{+}{+} \end{array}$$

Inc  $[3, \infty)$   $(-\infty, -1]$

Dec  $(-1, 3)$

$$\textcircled{3} 3x^2 - 6x + 9$$

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

$$x = \frac{2 \pm \sqrt{4-12}}{2}$$

no C.P.

$$f'(0) = 9 > 0$$

always  $\nearrow$