$\bar{x}$ 22.7/30
med 24

MATH 131
Quiz V
October 13, 1989 Name Key

1. Find dy/dx when $x^2 + 4xy^2 - y = 3$

5

$$2x^2 + 4x\,2y\frac{dy}{dx} + 4y^2 - \frac{dy}{dx} = 0$$

$$2x^2 + 4y^2 + \frac{dy}{dx}(8xy - 1) = 0$$

$$\frac{dy}{dx} = -\frac{2x^2 + 4y^2}{8xy - 1}$$

2. Find all <u>critical points</u> of the function $f(x) = 4x^3 - 36x^2 + 7$.

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$$f'(x) = 12x^2 - 72x$$

$$= 12x(x - 6)$$

$$x = 0,\ x = 6$$

3. The points x = 0 and x = 2 are the critical points of $f(x) = 3x^4 - 8x^3$. Test each point for local maximum, minimum or neither.

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$$f'(x) = 12x^3 - 24x^2 \qquad (= 12x^2(x - 2))$$

$$f''(x) = 36x^2 - 48x$$

$f''(0) = 0$? ⟶ f' no change of sign – neither

$f''(2) = 36 \cdot 4 - 48 \cdot 2 = 144 - 96 > 0$ ∪ rel min x = 2

4. For what values of x is the function $f(x) = x^3(x+3)^3$ increasing?

6

$$f'(x) = x^3\,3(x+3)^2 + 3x^2(x+3)^3$$

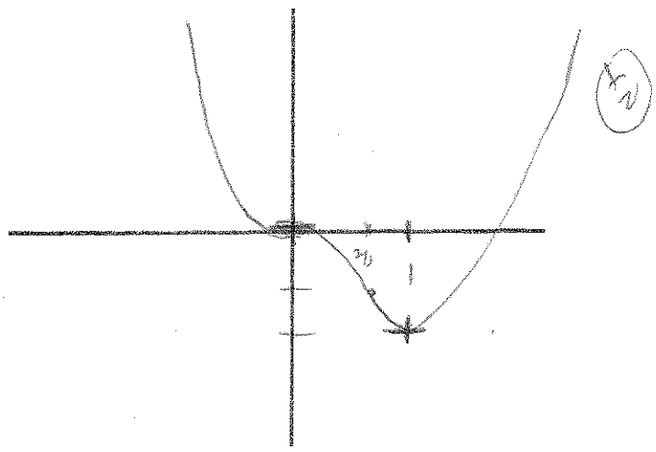
$$= 3x^2(x+3)^2[x + x + 3]$$

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

D $x < -\frac{3}{2}$

I $x > -3/2$

5. For the function $f(x) = 6x^4 - 8x^3$, find critical points, points of inflecti (if any), and sketch the graph.



$$f'(x) = 24x^3 - 24x^2$$

$$= 24x^2(x - 1)$$

C.P. $x = 0, 1$

$$f''(x) = 72x^2 - 48x$$

$$= 24x(3x - 2)$$

$$x = 0,\ \frac{2}{3}$$

P.I

x	y		
0	0	0	PI
1	0	−2	MIN
2/3		−1.18	PI

$$6\left(\tfrac{2}{3}\right)^4 - 8\left(\tfrac{2}{3}\right)^3 = -1.18$$

$$6\left(\tfrac{3}{2}\right)^4 - 8\left(\tfrac{3}{2}\right)^3 = -3^3$$