

Math 1121 Exam #2 (new ones)

Question 11. Please find the derivative:

$$(7x^4 + 8x)(4 - 6x^2 + x)$$

$$(7x^4 + 8x)(-12x + 1) + (4 - 6x^2 + x)(28x^3 + 8)$$

Question 12. Please find the derivative:

$$\frac{x^2 + 5x}{4x^2 - x^5}$$

$$\frac{(4x^2 - x^5) \cdot (2x + 5) - (x^2 + 5x)(8x - 5x^4)}{(4x^2 - x^5)^2}$$

Question 13. Please find the derivative:

$$g(t) = (15x^2 + 7x)^{-3}$$

$$-3(15x^2 + 7x)^{-4} \cdot (30x + 7)$$

Question 14. Please find the derivative:

$$\frac{4x+7}{(x^2+2x)^3}$$

$$\frac{(x^2+2x)^3 \cdot 4 - (4x+7) \cdot 3(x^2+2x)^2 \cdot (2x+2)}{((x^2+2x)^3)^2}$$

Question 15. Please find the derivative each time (you should do all 3, and you'll get credit if you get at least 2 right):

a) 7^{5x}

$$7^{5x} \ln 7 \cdot 5$$

b) e^{4x^2-x}

$$e^{4x^2-x} \cdot (8x-1)$$

c) $5^{\sqrt{x}}$

$$5^{\sqrt{x}} \ln 5 \cdot \frac{1}{2} x^{-1/2}$$

Question 16. In each part, evaluate the logarithm. (Your answer each time should be a number- make sure it is clear what the answer is in each part.)

a) $\log_3 9$ 2
(since $3^2 = 9$)

c) $\log_3 3$ 1
since $3^1 = 3$

b) $\log_2 16$ 4
(since $2^4 = 16$)

d) $\log_2 \frac{1}{8}$ -3
since $2^{-3} = \frac{1}{8}$

Question 17. Please find the derivative each time (you should do all 3, and you'll get credit if you get at least 2 right):

a) $\log_4(x)$ $\frac{1}{x \ln 4}$

b) $\ln(5x^2 + 7x)$ $\frac{1}{5x^2 + 7x} \cdot (10x + 7)$

c) $\log_2(18 + 4x)$ $\frac{1}{(18 + 4x) \ln 2} \cdot (4)$

Question 18. Please find the derivative:

$$f(x) = e^{x(x^5+7x)}$$

$$e^{x(x^5+7x)} \cdot (x(5x^4+7) + (x^5+7x) \cdot 1)$$

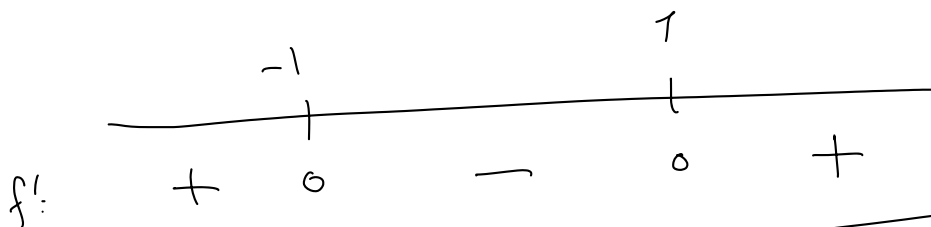
Question 19. Please give intervals where this function is increasing and decreasing:

$$f(x) = \frac{1}{3}x^3 - 3x^2 + 7x + 2$$

$$f'(x) = x^2 - 6x + 7$$

$$f'(x) = (x-7)(x+1)$$

$$f' = 0 : \quad \begin{array}{l} x-7=0 \\ x=7 \end{array} \quad \begin{array}{l} x+1=0 \\ x=-1 \end{array}$$



$$f'(-2) = (-2-7)(-2+1)$$

- -

$$f'(0) = (0-7)(0+1)$$

- +

$$f'(8) = (8-7)(8+1)$$

+ +

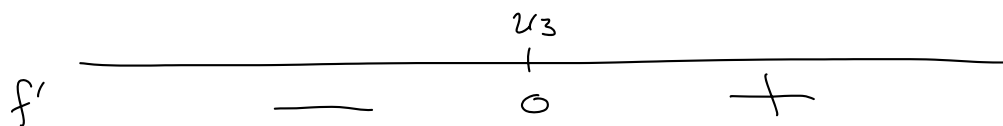
f is inc on $(-\infty, -1)$ & $(7, \infty)$
 dec on $(-1, 7)$

Question 20. Please give intervals where this function is increasing and decreasing:

$$f(x) = (x-1)e^{3x}$$

$$\begin{aligned} f'(x) &= (x-1) \cdot e^{3x} \cdot 3 + e^{3x} \cdot 1 \\ &= e^{3x} ((x-1) \cdot 3 + 1) \\ &= e^{3x} (3x-3+1) = \boxed{e^{3x} (3x-2)} \end{aligned}$$

$$f' = 0: \quad \cancel{e^{3x} = 0} \quad 3x-2 = 0$$
$$x = 2/3$$



$$f'(0) = e^{\tilde{0}} (3 \cdot 0 - 2) = -$$

+ -

$$f'(1) = e^{\tilde{1}} (3 \cdot 1 - 2) = +$$

+ +

f is increasing on $(-\infty, 2/3)$
decreasing on $(2/3, \infty)$