Math 1121 Exam #2 (new ones)

No calculators! You do not need to simplify numerical answers.
Submit your answers to gradescope in the usual way.

Question 11. Please find the derivative:

$$(8x^4 - 7x)(3 - 5x + x^2)$$

$(8x^4-7x)(-5+2x)+(3-5x+x^2)(32x^3-7)$

Question 12. Please find the derivative:

$$\frac{3x - 2}{x^2 + 5x}$$

$$\frac{(x^2+5x)\cdot 3 - (3x-2)\cdot(2x+5)}{(x^2+5x)^2}$$

Question 13. Please find the derivative:

$$g(t) = \sqrt{4t^2 + 3t}$$

$\frac{1}{2}(4t^2+3t)^{-1/2}\cdot(8t+3)$

Question 14. Please find the derivative:

$$2x(5x^2 + 18x)^4$$

$2x \cdot 4(5x^2+18x)^3(10x+18) + (5x^2+18x)^4 \cdot 2$

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

a) e^{4x+1}

$e^{4x+1} \cdot 4$

b) $3 \cdot 8^x$

$3 \cdot 8^x \ln 8$

c) 2^{x^2+1}

$2^{x^2+1} \cdot \ln 2 \cdot 2x$

Question 16. Please solve for x. If necessary, you can leave your answer uncomputed in terms of ln.

$$2 \cdot 5^x + 1 = 21$$

$2 \cdot 5^x = 20$

$5^x = 10$

$x \ln 5 = \ln 10$

$x = \frac{\ln 10}{\ln 5}$

Question 17. Please find the derivative each time (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) $\ln(3x + 1)$

$\frac{1}{(3x+1)} \cdot 3$

c) $\log_3(3 - 5x)$

$\frac{1}{(3-5x)\ln 3} \cdot -5$

Question 18. Please find the derivative:

$$f(x) = 5^x \log_3(x^2 + 5x)$$

$5^x \cdot \frac{1}{(x^2+5x)\ln 3} \cdot (2x+5) + \log_3(x^2+5x) \cdot 5^x \ln 5$

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

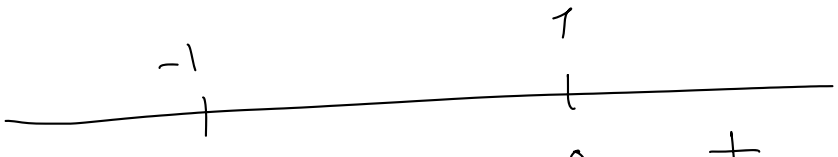
$$f(x) = \frac{1}{3}x^3 - 3x^2 + 7x + 2$$

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

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

$f' = 0$: $x-7=0$ $x+1=0$

$x=7$ $x=-1$



$f'(-2) = (-2-7)(-2+1)$ (−)(−)

$f'(0) = (0-7)(0+1)$ (−)(+)

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

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

dec on $(-1,7)$

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

$$f(x) = \frac{x-3}{4x-20}$$

$$f'(x) = \frac{(4x-20)\cdot 1 - (x-3)\cdot 4}{(4x-20)^2} = \frac{4x-20-4x+12}{(4x-20)^2}$$

$$\boxed{f'(x) = \frac{-8}{(4x-20)^2}}$$

$f'=0$: $\frac{-8}{(4x-20)^2} = 0$

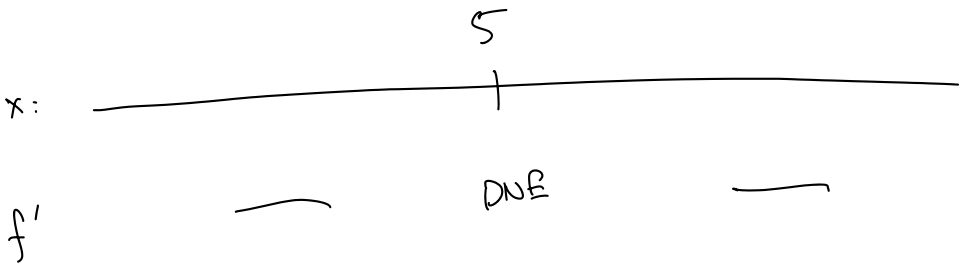
$-8 = 0\cdot(4x-20)^2$

$-8 = 0$ no solns!

f' DNE: $(4x-20)^2 = 0$

$4x = 20$

$\boxed{x = 5}$



$f'(0) = \frac{-8}{(\text{neg})^2} = \frac{-}{+} = -$

$f'(6) = \frac{-8}{(\text{pos})^2} = \frac{-}{+} = -$

$f(x)$ is dec on $(-\infty, 5)$ & $(5, \infty)$,

never inc.