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Name Alejandro Islos Guerrero Mat. AD1570159

I. Circle the right answer. (5 point each)

1) The following functions is not differentiable at $x = 2$

a) $f(x) = \frac{x+1}{x-2}$
 b) $f(x) = (x-2)^2$
 c) $f(x) = \frac{x^2}{x+2}$
 d) $f(x) = \sqrt{x+2}$

$x=2$
 x^2-4x+4
 $x^2-4x=-4$
 $x=-2$

$-L = \frac{\sqrt{b^2 - 4ac}}{2a}$

2) The following function is not differentiable at $x = 1$

a) $f(x) = |x+1|$
 b) $f(x) = x^3 - 1$
 c) $f(x) = \frac{1}{x+1}$
 d) $f(x) = \sqrt[3]{x-1}$

$x=-1$
 $x=1$
 $x^3=1$
 $x=\sqrt{1}$
 $x=-1$
 $x=0^3$
 $x=1$

3) Find the slope for $f(x) = -4x^3$ at $x = 2$

- A) 32 B) -32 C) -96 D) -48

$-12x^2$
 $-12(2)^2$
 $-12(4)$
 -48

4) What is the equation of the tangent line for the curve $y = x^3 + 2$ at the point $(-2, -6)$

- A) $y = -12x - 30$
 B) $y = 12x - 30$
 C) $y = 12x + 18$
 D) $y = -12x - 18$

$3x^2$
 $3(-2)^2$
 $3(4)$
 $m=12$
 $-6 = 12(-2) + b$
 $-6 = -24 + b$
 $b = 18$
 $y = 12x + 18$

II. Answer the following questions.

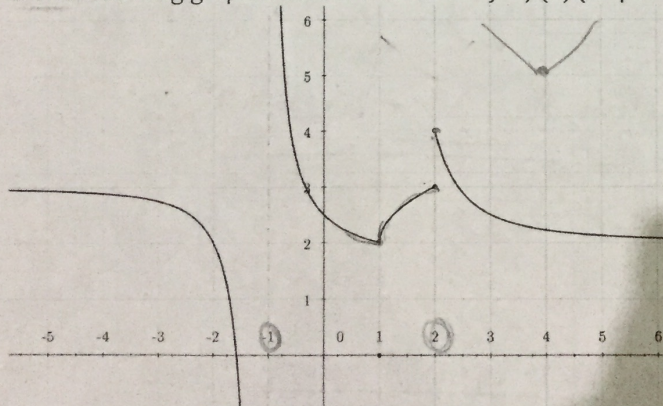
1. The concentration of a drug in the bloodstream is given by: (15 points)

$C = 870 - 2t^2$. Where t is measured in minutes. Find the rate of change in the concentration at 30 minutes.

$-4t'$
 $-4(30)'$
 $= -120$

-120 is the rate of change

2. The following graph shows the function $y = f(x)$ (20 points)



a) Find the values of "x" where the function is not continuous $x = -1, x = 2$

b) Find the values of "x" where the function is not differentiable $x = 2$

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III. Find the derivative by definition of the following function: (15 points)

$$f(x) = 4x^2 + 7$$

$$\lim_{h \rightarrow 0} \frac{4(x+h)^2 + 7 - (4x^2 + 7)}{h}$$

$$= \frac{4(x^2 + 2xh + h^2) + 7 - 4x^2 - 7}{h}$$

$$= \frac{4x^2 + 8xh + 4h^2 + 7 - 4x^2 - 7}{h}$$

$$= 8x + 4h$$

$$= 8x$$

$$\underline{\underline{f'(x) = 8x}}$$

IV. Find the derivative of the following:

a) $f(x) = \frac{7}{2x^2} - 6x^8 + 3\sqrt[5]{x^4}$ (10 points) $\frac{4}{5} - \frac{8}{2} = -\frac{1}{5}$

$$\frac{7}{2}x^{-2} - 6x^8 + 3x^{4/5}$$

$$-\frac{14}{2}x^{-3} - 48x^7 + \frac{12}{5}x^{-1/5}$$

$$\frac{-7}{x^3} - 48x^7 + \frac{12}{5\sqrt[5]{x}}$$

$$\underline{\underline{f'(x) = \frac{-7}{x^3} - 48x^7 + \frac{12}{5\sqrt[5]{x}}}}$$

b) $f(x) = \sqrt[3]{7x+2} - 3(1-5x^2)^6$ (10 points) $\frac{1}{3} - \frac{3}{3} = -\frac{2}{3}$

$$(7x+2)^{1/3} - 3(1-5x^2)^6$$

$$\frac{1}{3}(7x+2)^{-2/3} - 18(1-5x^2)^5$$

$$\frac{1}{3}(7x+2)^{-2/3} \cdot (7) - 18(1-5x^2)^5 \cdot (-10x)$$

$$\frac{7}{3}(7x+2)^{-2/3} + 180x(1-5x^2)^5$$

$$\underline{\underline{f'(x) = \frac{7}{3}(7x+2)^{-2/3} + 180x(1-5x^2)^5}}$$

c) $f(x) = 5(6x-9x^3)^7$ (10 points)

$$35(6x-9x^3)^6$$

$$35(6x-9x^3)^6 \cdot (6-27x^2)$$

$$(210 - 945x^2)(6x-9x^3)^6$$

$$\underline{\underline{f'(x) = 35(6x-9x^3)^6 \cdot (6-27x^2)}}$$