

E.C. Assignment °

I. a. $f'(x) = -6x^{-2} - x^{-1/2}$

b. $f'(x) = \frac{(x+2)(6x^2-10x) - (2x^3-5x^2)(1)}{(x+2)^2}$

c. $f'(x) = \frac{(4m-3)^4(3m^2-2) - (m^2-2m)(4(4m-3)^3(4))}{(4m-3)^8}$

d. $f'(x) = t^3 \left(\frac{1}{2} (t^4+5)^{5/2} (4t^3) \right) + (t^4+5)^{7/2} (3t^2)$

e. $\frac{dp}{dx} = p' = 5(9e^{2x+1}-3)^4 (9(2)e^{2x+1})$

f. $\frac{dy}{dx} = y' = \frac{(\ln x)[(x^2+1)(2e^{2x}) + (2x)e^{2x}] + (x^2+1)e^{2x}(\frac{1}{x})}{(\ln x)^2}$

g. $f'(x) = 10 \cdot \ln 4 \cdot 4^{1/x} \cdot \left(\frac{1}{x^2} \right)$

h. $f'(x) = \frac{2}{7} (1.2x^5 - 7x^3 - \pi)^{-5/7} (6x^4 - 21x^2)$

i. $r'(x) = e^x \left(\frac{1}{2} (2x^3 - 9x^2 + 13x + e)^{-1/2} (6x^2 - 18x + 13) \right) + (2x^3 - 9x^2 + 13x + e)^{1/2} e^x$

j. $y' = (12x-15)e^{6x^2-15x} (\ln 6x^2-15x) + e^{6x^2-15x} \left(\frac{12x-15}{6x^2-15x} \right)$

$$\text{II. } f(x) = \frac{3x^2}{x^2 - 16}$$

1. Domain: $x^2 - 16 \neq 0$

$$x^2 \neq 16$$

$$x \neq \pm 4$$

$$x \neq 4$$

$$x \neq -4$$

Note: $(4)^2 - 16 = 16 - 16 = 0$

Note: $(-4)^2 - 16 = 16 - 16 = 0$

2. V.A.: $x = -4$ and $x = 4$

3. H.A.: $\lim_{x \rightarrow \infty} f(x) = \lim_{x \rightarrow \infty} \frac{3x^2}{x^2 - 16} \left| \frac{\infty}{\infty} \right| = \frac{3}{1} = 3$

4. x-int: $3x^2 = 0 \Rightarrow x = 0$ $(0, 0)$

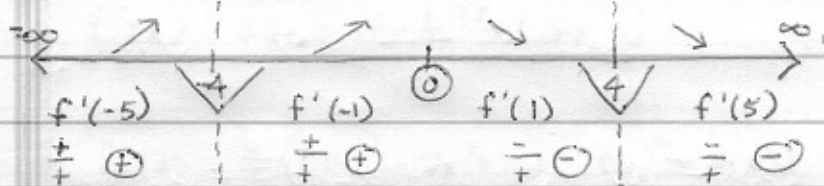
5. y-int: $f(0) = \frac{3(0)^2}{(0)^2 - 16} = 0$ $(0, 0)$

* $f'(x) = \frac{(x^2 - 16)(6x) - (3x^2)(2x)}{(x^2 - 16)^2} = \frac{6x^3 - 96x - 6x^3}{(x^2 - 16)^2} = \frac{-96x}{(x^2 - 16)^2}$

6. C#'s: $0, \pm 4$

ZERO: $-96x = 0 \Rightarrow x = 0$

DNE: $(x^2 - 16)^2 = 0 \Rightarrow x^2 - 16 = 0 \Rightarrow x = \pm 4$



7. INC. $\nearrow$: $(-\infty, -4); (-4, 0)$

8. DEC. $\searrow$: $(0, 4); (4, \infty)$

9. Relative max of $f(0) = \frac{3(0)^2}{(0)^2 - 16} = \frac{0}{-16} = 0$

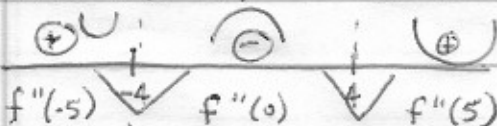
10. Relative min (N/A)

* $f''(x) = \frac{(x^2 - 16)^2(-96) - (-96x)(2(x^2 - 16)(2x))}{(x^2 - 16)^4} = \frac{(x^2 - 16)(-96) - (-96x)(2)(2x)}{(x^2 - 16)^3}$

$$= \frac{-96x^2 + 1536 + 384x^2}{(x^2 - 16)^3} = \frac{288x^2 + 1536}{(x^2 - 16)^3}$$

ZERO: $288x^2 + 1536 = 0$ N/A

DNE: $(x^2 - 16)^3 = 0 \Rightarrow x^2 - 16 = 0 \Rightarrow x = \pm 4$



11. C.Up $\cup$: $(-\infty, -4); (4, \infty)$

12. C.down $\cap$: $(-4, 4)$

13. Point of Inflection:

$(x, f(x)) \Rightarrow$ N/A b/c of vertical asymp.

