25-octubre-18

Guía 4

1.- $f(x) = x^2 - 4x + 5$ $\quad 2x - 4$

$(x-5)(x+1)$ $\quad x = 2$

$x = 5$ $\quad f'(x) = (2)^2 - 4(2) + 5$

$x = -1$ $\quad \boxed{f'(2) = 0}$

$f'' = 2$

2.- $f(x) = 6x - x^2 \rightarrow f(3) = 6(3)(9)$

$f(3) = 9$

$f'(x) = -2x + 6$ $\quad f''(x) = 9$

$x = 3$

3.- $f(x) = x^3 - 2x^2 + 5$ $\quad f(0) = 0^3 - 2(0)^2 + 5$ Maximo

$f(0) = 5$

$3x^2 - 4x = 0$

$x(3x-4) = 0$ $\quad f(\frac{4}{3}) = (\frac{4}{3})^3 - 2(\frac{4}{3})^2 + 5$ Miminimo

$x = 0$ $\quad f(\frac{4}{3}) = \frac{103}{27}$

$x = \frac{4}{3}$ $\quad 6x - 4$

$x = 2/3$ (Punto de inflexion)

4. $f(x) = x^3 - 3x + 5$

$3x^2 - 3 = 0$ $\quad f(1) = (1)^3 - 3(1) + 5$

$3(x^2 - 1) = 0$ $\quad f(1) = 1 - 3 + 5 \rightarrow 3$ minimo

$x_1 = 1$

$x_2 = -1$ $\quad f(-1) = -1 + 3 + 5 = 7$ maximo

5. $f(x) = x^3 - 3x^2 + 3x + 5$

$3x^2 - 6x + 3$ $\quad x_1 = 1$

$3(x^2 - 2x + 1) = 0$ $\quad x_2 = 1$

$(x-1)(x-1)$

$f(x) = (1)^3 - 3(1)^2 + 3(1) + 5$

$f(1) = 1 \cancel{-3+3} + 5 = 6$ maximo

Punto de inflexión

$3x^2 - 6x + 3 \rightarrow 6x - 6 \quad \boxed{x = 1}$

6- $f(x) = 2x^3 + 3x^2 - 36x + 17.$

$6x^2 + 6x - 36$ $\qquad x_1 = -3$

$6(x^2 + x - 6) \rightarrow (x+3)(x-2) \quad x_2 = 2$

$f(x) = 2(-3)^3 + 3(-3)^2 - 36(-3) + 17 = 98$

$f(x) = 2(2)^3 + 3(2)^2 - 36(2) + 17 = -27$

Maximo $\rightarrow 98$

minimo $\rightarrow -27$

7- $f(x) = 10 + 60x + 9x^2 - 2x^3$

$60 + 18x - 6x^2 \qquad f(5) = 285 \rightarrow$ maximo

$6(10 + 3x - x^2) \qquad f(2) = -58 \rightarrow$ minimo

$-6(-10 - 3x + x^2)$

$(x+2)(x-5) \qquad -12x + 8 = 0$

$x_1 = 5 \qquad x = \frac{2}{3}$ punto de inflexion

$x_2 = -2$

8.- $f(x) = 27 - x^3$

$-3x^2$

$x = 0$

9.- $f(x) = x^4 - 2x^2$

$f(0) = 0$ maximo $(0, 0)$

$f(1) = -1$ minimo $(1, -1)$

$4x^3 - 4x$

$f(-1) = -1$ $(1, -1)$

$4x(x^2 - 1) = 0$

$x = 0$

$12x^2 - 4 = 0$ $(1.15, 0.89)$

$x = 1$

$4(3x^2 - 4) = 0$ $(-1.15, -0.89)$

$x = -1$

$x_1 = -1.15$ $x_2 = 1.15$

puntos de inflexion

10.- $f(x) = 3x^5 - 5x^3$

$15x^4 - 15x^2$

$x = 0$

$x_1 = 1$

$15x^2(x^2 - 1) = 0$

$x_2 = -1$

$f(0) = 0$ $(0, 0)$ maximo relativo

$f(1) = -2$ $(1, -2)$ minimo

$f(-1) = 8$ $(1, 8)$ maximo

$60x^3 - 30x$

$f(0) = 0$ $(0, 0)$

$f(.70) = -1.23$ $(0.70, -1.23)$

$30x(2x^2 - 1) = 0$

$f(0.70) - 1.21$ $(0.70, 1.21)$

$x = 0$ $x = -0.70$

$x = 0.70$

$f(x) =$ ~~[illegible]~~ $x + \frac{9}{x}$

$f(3.16) = 3.16 + \frac{1}{3.16} = 3.47$

$\frac{9}{x^2} + 1$ $x_1 = 3.16$

$x_2 = -3.16$

$f(-3.16) = -3.16 - \frac{1}{3.16} = -3.47$

$\sqrt{10} = x$ $(3.16, 3.47)$ maximo

$10 = x$ $(-3.16, -3.47)$ minimo

$\sqrt{-10} = x$

$\frac{18}{x^3} = \neq$ no existe

12 - $x^2 + \frac{2}{x}$ $x^2 + 2x^{-1}$ $(1, 3)$ maximo

$2x - \frac{\cancel{2x}}{x^2} = 0$ $f(x) = (1)^2 + \frac{2}{1}$

$2x - 2 = 0$ $f(3) = 3$

$x = 1$

13 - xe^{-2x}

$2e^{-2}x \rightarrow \frac{2}{e^2}x = 0$

$x_0 = (0, 0)$ punto de maximo

$2e^{-2} \rightarrow$ no tiene "x"

14.- $f(x) = x^2 e^{-x/3}$

$$(x^2)(e^{-x/3}) \cdot \frac{1}{3} + e^{-x/3} + 2x = 0$$

$$\ln x^2 - \frac{x^2}{3} + \left(-\frac{2}{3}x^2\right)$$

$$\ln x^2 - \frac{x^2}{6} = -\frac{2x^2}{3}$$

15.- $f(x) = (x+4)^2 e^{-x/5}$

$$e^{-x/5}\left[-\frac{1}{5}(x+4)^2 + 2(x+4)\right] = 0$$

$$\frac{1}{5}(x+4)^2 + 2(x+4) = 0$$

$$2(x+4) = \frac{1}{5}(x+4)^2$$

$$2 = \frac{1}{5}(x+4)$$

$$10 - 4 = x$$

$$\boxed{x = 6}$$

$$f'(x) = (e^{-x/5}\left(-\frac{1}{5}\right) + e^{\frac{x}{5}}(2)(x+4)$$

$$e^{-x/5}\left[-\frac{1}{5}(x+4)^2 + 2(x+4)\right] = 0$$

$$-\frac{1}{5}(x+4)^2 + 2(x+4) = 0$$

$$\boxed{x = 4}$$

$(6+4)^2 e^{-6/5} = 30.11$ (6, 30.11) maximo

$(8)^2 e^{-4/5} = 28.75$ (4, 28.75) maximo

16.- $f(x) = \dfrac{1-\ln x}{x}$

$$f'(x) = \frac{x\left(-\frac{1}{x}\right) - (1-\ln x)(1)}{x^2}$$

$$f'(x) = \frac{-1-1+\ln x}{x^2}$$

$$f'(x) = \frac{\ln x - 2}{x^2}$$

$$\frac{\ln x - 2}{x} = 0$$

$$\ln x - 2 = 0$$

$$e^{\ln x} = e^2$$

$x = e^2$

$$f(e^2) = \frac{1-\ln e^2}{e^2}$$

$$f(e^2) = \frac{1-\ln e^2}{e^2}$$

$$f(e^2) = \frac{1-2}{e^2}$$

$$f(e^2) = -e^{-2}$$

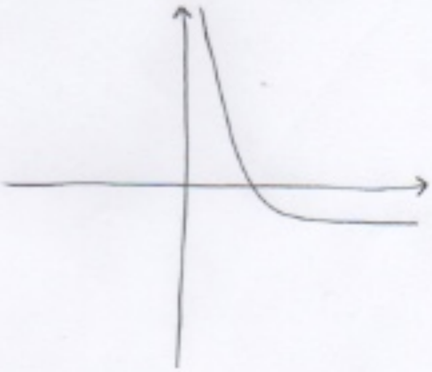
$(e^2, -e^{-2})$

$$f''(x) = \frac{x+\left(\frac{1}{x}\right) - (\ln x - 2)(2x)}{x^4}$$

$$f''(x) = \frac{5x - 2x\ln x}{x^4}$$

$$\frac{5x - 2x\ln x}{x^4} = 0$$

$$\frac{x(5-\ln x)}{x^4} = 0$$



$$x(5 - 2\ln x) = 0$$

$$5 - 2\ln x = 0$$

$$5 = 2\ln x$$

$$\ln x = \frac{5}{2}$$

$$\cancel{e\ln} x = e^{5/2}$$

$$x = e^{5/2}$$

$$f(x) = \frac{1 - \ln x}{x}$$

$$f(e^{5/2}) = \frac{1 - \ln(e^{5/2})}{e^{5/2}}$$

$$f(e^{5/2}) = -\frac{3}{2}e^{-5/2}$$

Concavidad

$$f''(e^2) = \frac{5e^2 - 2e^2\ln e^2}{e^8}$$

$$\frac{5e^2 - 4e^2}{e^8} = \frac{e^2}{e^8} \Rightarrow \frac{1}{e^6}$$

C.h. arriba

$(0, e^{5/2})$

C.h. abajo

$(e^{5/2}, \infty)$