UNIVERSIDAD DE SANTIAGO DE CHILE
DEPARTAMENTO DE MATEMÁTICA Y C.C
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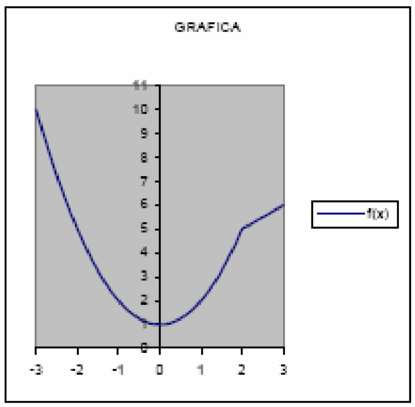
CALCULO APLICADO
PRUEBA PAS
(Solución)

1.

a)



b) $\lim_{x\to 2^-}\left(x^2+1\right)=5 \ \wedge \ \lim_{x\to 2^+}\left(x^2+3\right)=5$; continua en $x_0=2$

$\lim_{x\to x_0} f(x) = f(x_0) \forall x_0 \in Dom(f) = R$

2.

a) $$\lim_{x\to 3^-}\left(\frac{x^2-4}{x-3}\right)=-\infty \wedge \lim_{x\to 3^{+-}}\left(\frac{x^2-4}{x-3}\right)=\infty \Rightarrow x=3 \text{ Asíntota Vertical}$$

$$m=\lim_{x\to\infty}\left(\frac{f(x)}{x}\right)=\lim_{x\to\infty}\left(\frac{1-\frac{4}{x^2}}{1-\frac{3}{x^2}}\right)=1\wedge$$

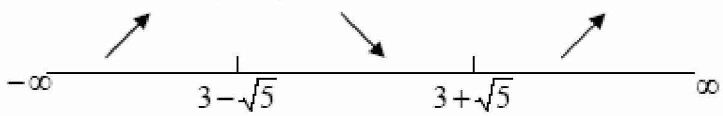
$$b=\lim_{x\to\infty}(f(x)-mx)=\lim_{x\to\infty}\left(\frac{x^2-4}{x-3}-x\right) \therefore y=x+3 \text{ Asíntota Oblicua}$$

b) $$f'(x)=\frac{2x(x-3)-(x^2-4)}{(x-3)^2}=\frac{x^2-6x+4}{(x-3)^2}>0 \text{ si } x^2-6x+4>0$$

$$x^2-6x+4=0\Rightarrow x=3\pm\sqrt{5}$$

c) $$f''(x)=\frac{10}{(x-3)^3}>0\Leftrightarrow x>3 \text{ Concavidad Arriba}$$

$$f''(x)=\frac{10}{(x-3)^3}<0\Leftrightarrow x<3 \text{ Concavidad Abajo}$$



d) $$f'(x)=0\Leftrightarrow x^2-6x+4=0\Leftrightarrow x=3\pm\sqrt{5}$$

$$f''(3-\sqrt{5})=\frac{10}{(-\sqrt{5})^3}<0: x=3-\sqrt{5} \text{ Punto máximo}$$

$$f''(3+\sqrt{5})=\frac{10}{(\sqrt{5})^3}>0: x=3+\sqrt{5} \text{ Punto mínimo}$$

3.

$$3x^2y^2+2x^3yy'-4xy-2x^2y'+3y^2+6xyy'-8y-8xy'=0$$

$$y'=\frac{4xy-3x^2y^2+8y-3y^2}{2x^3y-2x^2+6xy-8x}.$$

Si $x=1\Rightarrow 4y^2-10y=6\Rightarrow 2y^2-5y-3=0 \therefore y=3\wedge y=-1/2$

$$y'(1)=9/7;\quad y'\left(-\frac{1}{2}\right)=\frac{15}{28}$$

4.

$$d(A,B) = \sqrt{100^2 + (A(t) + B(t))^2} = d(t)$$

$$d(t) = \frac{(A(t)+B(t))(A'(t)+B'(t))}{\sqrt{100^2 + (A(t)+B(t))^2}} \quad \text{: Si t = 4,}$$

$$d(4) = \frac{(140+100)(35+25)}{\sqrt{100^2 + (240)^2}} = 55{,}38 \quad \text{millas/hrs.}$$