Teste 10

1) a) $x^2 - 9 \neq 0 \Leftrightarrow x^2 \neq 9 \Leftrightarrow x \neq 3 \cup x \neq -3$

$D_f =]-\infty, -3[\cup]3, +\infty[$

b) $x^2 - 1 \neq 0 \Leftrightarrow x \neq 1 \cup x \neq -1$

$D_g =]-\infty, -1[\cup]1, +\infty[$

2) a) $\lim\limits_{x \to 3} \frac{x^2 - 9}{x - 3}$ $(/3)$ $= \frac{\cancel{(x-3)}(x+3)}{\cancel{x-3}} = x + 3 = 3 + 3 = 6$

b) $\lim\limits_{x \to +\infty} \frac{2x^3 - x - 4}{5x^3 + 3x^2}$ $(/x^3)$ $= \frac{2 - \frac{1}{x} + \frac{4}{x^2}}{5 + \frac{3}{x}} = \frac{2 - 0 + 0}{5 + 0} = \frac{2}{5}$

3) $f(2) = \frac{x^2 - 4}{x - 2} = \frac{\cancel{(x-2)}(x+2)}{\cancel{x-2}} = x + 2 = 2 + 2 = 4$

4) $f(0) = x^3 - 3x + 1 = (0)^3 - 3(0) + 1 = 0 - 0 + 1 = 1$

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

$f(0) = 1 > 0$

$f(1) = -1 < 0$

5) $x - 2 \neq 0 \Leftrightarrow x \neq 2$

$f(2^+) = \frac{2x^2 - x + 1}{x - 2} = \frac{2(2^+)^2 - 2^+ + 1}{2 - 2} = \frac{8 - 2 + 1}{0^+} = \frac{7}{0^+} = +\infty$

$f(2^-) = \frac{2x^2 - x + 1}{x - 2} = \frac{2(2^-) - 2^- + 1}{2^- - 2} = \frac{7}{0^-} = -\infty$

$$m = \frac{2x^2 - x + 1}{x(x-1)} = \frac{2x^2 - x + 1}{x^2 - x} = 2 \cdot \frac{\cancel{x^2 - x + 1}}{\cancel{x^2 - x}} \quad 2 \times 1 = 2$$

$$b = \lim_{x \to +\infty} \left[\frac{2x^2 - x + 1}{x - 1} - 2x \right]$$

6)

$f(2) = x^3 - 3x^2 - 9x + 5 = (2)^3 - 3(2)^2 - 9(2) + 5 = 8 - 12 - 18 + 5 =$
$= -17$

$f'(2) = 3x^2 - 6x - 9 = 3(2)^2 - 6(2) - 9 = 12 - 12 - 9 = -9$

$y = -9x + (-17 - (-9(2))) = -9x + 1$

7) a) $\int 4x^3 - 2x + 5 \, dx = \frac{4x^4}{4} - \frac{2x^2}{2} + 5x + c, \ c \in \mathbb{R}$

b) $\int \frac{6x^2}{x^3+1} = \int 2 \frac{3x^2}{1 + x^3} = 2 \arctan(x^3) + c, \ c \in \mathbb{R}$

c) $\int x \cdot \cos(x) \, dx = x \cdot sen(x) - \int \cos(x) = x \cdot sen(x) + sen(x)$

$x \cdot sen(x) + sen(x) + c, \ c \in \mathbb{R}$

8) a) $\int_1^3 2x - 1 \, dx = \left[\frac{2x^2}{2} \right]_1^3 = \frac{2(3)^2}{2} - \frac{2(1)^2}{2} = \frac{18}{2} - \frac{2}{2} =$
$= 9 - 1 = 8$

b) $\int_0^1 x \cdot e^x \, dx = \left[x \cdot e^x \right]_0^1 - \int_0^1 e^x = \left[x \cdot e^x - e^x \right]_0^1 =$

$(1 \cdot e^1 - e^1) - (0 \cdot e^0 - e^0) = 0 - (-1) = 0 + 1 = 1$