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

$x \neq -3$

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

b) $4 - x^2 > 0 \Leftrightarrow -x^2 > 4 \Leftrightarrow -x > 2 \Leftrightarrow x < 2$

$D_f =]-4, 4[$

2a) $\lim\limits_{x \to 2} \frac{x^2 - 4}{x^2 - 3x + 2} = \frac{\cancel{(x-2)}(x+2)}{(x-1)\cancel{(x-2)}} = \frac{x+2}{x-1} = \frac{2+2}{2-1} = \frac{4}{1} = 4$

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

c) $\lim\limits_{x \to 0} \frac{\operatorname{sen}(3x)}{x} = \frac{\cos(3x)}{1} = \cos(3x) = \cos(3(0)) = 1$

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

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

$K = 4$

4)

$h(0) = x^3 - 3x + 1 \Leftrightarrow (0)^3 - 3(0) + 1 = 1$

$h(1) = x^3 - 3x + 1 \Leftrightarrow 1^3 - 3(1) + 1 = -1$

$f(0) = 1 > 0$

$f(1) = -1 < 0$

5)

$x - 3 \neq 0 \Leftrightarrow x \neq 3$

$f(3^+) = \frac{2x + 1}{x - 3} = \frac{2(3^+) + 1}{3^+ - 3} = \frac{7}{0^+} = +\infty$

$$\lim_{x \to +\infty} = \frac{2x+1}{x-3} = \frac{+\infty}{+\infty}$$

$$m = \frac{2x+1}{x(x-3)} = \frac{2x+1}{x^2-3x} =$$

6)

a) $4x^3 + 6x + 5$

b) $\frac{2x(x-2) - x^2+1}{(x-2)^2}$

c) $\frac{1}{x^3 + 2x}$

d) $e^{x^2-1} \cdot 2x$

7)

$f(1) = x^3 - 2x \Leftrightarrow 1^3 - 2(1) \Leftrightarrow 1 - 2 = -1$

$f'(1) = 3x^2 - 2 \Leftrightarrow 3(1)^2 - 2 \Leftrightarrow 3 - 2 = 1$

$y = x - 2$

R: Reta tangente $= x - 2$

8)

a) $\int 4x^3 - 6x + 2 \, dx = \frac{4x^4}{4} - \frac{6x^2}{2} + 2x + C, C \in \mathbb{R}$

b) $\int \frac{2x}{x^2+1} \, dx = \ln|x^2+1) + C, C \in \mathbb{R}$

c) $\int x \cdot e^x \, dx \Leftrightarrow x \cdot e^x - \int e^x = x \cdot e^x - e^x + C, C \in \mathbb{R}$

D) $\int \ln(x) \, dx \Leftrightarrow x \ln(x) - x + C, C \in \mathbb{R}$

9a) $\int_0^2 3x^2 - 4x + 1 \, dx = \left[\frac{3x^3}{3} - \frac{4x^2}{2} + x\right]_0^2 \Leftrightarrow$

$\Leftrightarrow \frac{3(2)^3}{3} - \frac{4(2)^2}{2} + 2 - \frac{3(0)^3}{3} - \frac{4(0)^2}{2} + 0 =$

$\frac{24}{3} - \frac{16}{2} + 2 = 8 - 8 + 2 = 2$

b) $\int_1^e \frac{1}{x} \, dx \Leftrightarrow \left[\ln(x)\right]_1^e \Leftrightarrow \ln(e) - \ln(1) = 1 - 0 = 1$

10)

$F(1) = 2x^3 - 4x + c = 3 \ , \ c = -3$

11) $\int_{-2}^{2} x^2 - 4 \, dx = \left[\frac{x^3}{3} - 4x\right]_{-2}^{2} = \frac{2^3}{3} - 4(2) - \frac{-2^3}{3} - 4(-2) =$

$= \frac{8}{3} - 8 - \frac{-8}{3} + 8 = 0$