

$$1a) 4 - x > 0 \Leftrightarrow x < 4$$

$$x - 1 > 0 \Leftrightarrow x > 1$$

$$D_f =]1, 4[$$

$$b) x^2 - 16 > 0 \Leftrightarrow x^2 > 16 \Leftrightarrow x > 4$$

$$D_g =]4, +\infty[$$

$$\begin{aligned} 2a) \lim_{x \rightarrow 3} \frac{x^2 - 9}{x^2 - 5x + 6} &\stackrel{0}{=} \lim_{x \rightarrow 3} \frac{(x-3)(x+3)}{(x-2)(x-3)} = \lim_{x \rightarrow 3} \frac{x+3}{x-2} = \frac{3+3}{3-2} \\ &= \frac{6}{1} = 6 \end{aligned}$$

$$\begin{aligned} b) \lim_{x \rightarrow 0} \frac{\sin(5x)}{2x} &= \lim_{x \rightarrow 0} \frac{\sin(5x)}{2x} \cdot \frac{3}{3} = \frac{\sin(5x)}{5x} \cdot 3 = 1 \cdot 3 = 3 \\ &\quad | \quad 3 \frac{\sin(2x)}{2x} = 3 \cdot 1 = 3 \end{aligned}$$

$$c) \lim_{x \rightarrow 0} \frac{\sin(4x)}{\sin(2x)} = 2 \frac{\sin(2x)}{\sin(2x)} = 2 \cdot 1 = 2$$

3)

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

$$k = 2$$

$$4) f(0) = x^3 - 6x^2 + 9x - 1 = 0^3 - 6(0)^2 + 9(0) - 1 = -1$$

$$f(1) = 1^3 - 6(1)^2 + 9(1) - 1 = 1^3 - 6(1)^2 + 9(1) - 1 = 1 - 6 + 9 - 1 = 3$$

$$f(0) = -1 < 0$$

$$f(1) = 3 > 0$$

$$5) x+y \neq 0 \Leftrightarrow x \neq -y$$

$$f(-y^+) = \frac{3x-2}{x+y} = \frac{3(-y^+)-2}{-y^++y} = \frac{-16}{0^+} = +\infty$$

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

$$\Delta V = -4$$

$$\Delta H = 3$$

6)

$$a) \frac{2x+3}{x^2+3x}$$

$$b) \sqrt[3]{2x^3-5}$$

$$c) e^{4x-x^2} \cdot (4-2x)$$

$$d) \frac{3x^2(x+2)-1(x^3-1)}{(x+2)^2} = \frac{3x^3+6x^2-x^3-1}{(x+2)^2} = \frac{2x^3+6x^2-1}{(x+2)^2}$$

7)

$$f(2) = x^2 - 4x - 3 = 2^2 - 4(2) - 3 = 4 - 8 - 3 = -7$$

$$f'(2) = 2x - 4 \Leftrightarrow 2(2) - 4 = 4 - 4 = 0$$

$$y = 0x - (-7 - 0(2)) = -7$$

$$8a) \int 6x^2 - 4x + 3 \, dx = \frac{6x^3}{3} - \frac{4x^2}{2} + 3x + C, \text{LG1N}$$

$$b) \int \frac{3x^2+3}{x^3+3x} \, dx = \ln(x^3+3x) + C, C \in \mathbb{R}$$

$$c) \int u^2 \cdot e^x \, du = u^2 \cdot e^x - \int 2u \cdot e^x \, du = u^2 \cdot e^x - \frac{2u^2}{2} \cdot e^x + C, \quad C \in \mathbb{R}$$

$$d) \int x \cdot \ln(x) \, dx = x \cdot \frac{1}{x} - \int \ln(x) \, dx \Rightarrow x \cdot \frac{1}{x} - \frac{1}{x} + C, \quad C \in \mathbb{R}$$

9)

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

$$\frac{18}{2} - 2 - \frac{2}{2} - 1 = 9 - 2 - 1 - 1 = 5$$

$$b) \int_0^1 e^{2x} \, dx = \left[\frac{e^{2x}}{2} \right]_0^1 = \frac{e^{2(1)}}{2} - \frac{e^{2(0)}}{2} \leq 3$$

10)

$$f(1) = \frac{4h^4}{4} + \frac{2h^2}{2} + C = 5 \Leftrightarrow \frac{4(1)^4}{4} + \frac{2(1)^2}{2} + C = 5$$

$$\Leftrightarrow \frac{4}{4} + \frac{2}{2} + C = 5 \Leftrightarrow 1 + 1 + C = 5 \Leftrightarrow 2 + C = 5$$

$$\Leftrightarrow C = 5 - 2$$

$$\Leftrightarrow C = 3$$

11)

$$\int_0^2 2u - u^2 \, du = \left[\frac{2u^2}{2} - \frac{u^3}{3} \right]_0^2 = \frac{2(2)^2}{2} - \frac{2^3}{3} - \frac{2(0)^2}{2} - \frac{0^3}{3}$$

$$= \frac{8}{2} - \frac{8}{3} - \frac{0}{2} - \frac{0}{3} = \frac{8}{2} - \frac{8}{3} = \frac{24}{6} - \frac{16}{6} = \frac{8}{6}$$

(x3) (x2)