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LISTA 5

1-)

a-) para cima

b-)  $D = 35$

$$x_1 = 3/2 \quad \text{e} \quad x_2 = -1$$

$$c-) y_{1,2} = \frac{-(-1) \pm \sqrt{1 - 4 \cdot 2 \cdot (-25)}}{2 \cdot 2} = \frac{1 \pm \sqrt{1 + 200}}{4} = \frac{1 \pm \sqrt{201}}{4}$$

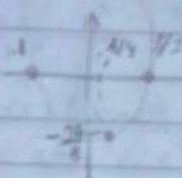
$$d-) f(x) = 2x^2 - x - 3 = y$$

$$2 \cdot 0^2 - 0 - 3 = y$$

$$y = -3$$

$$y = 0$$

e-)



f-) olhando para a parábola  $I_m = \{ y \geq -\frac{25}{8} \}$   
ou seja  $y = -\frac{25}{8}$

g-) Crescente =  $(\frac{1}{4}, +\infty)$  Decrescente =  $(-\infty, \frac{1}{4})$

h-) positiva =  $(-1, \frac{3}{2})$  negativa =  $(-\infty, -1) \cup (\frac{3}{2}, +\infty)$

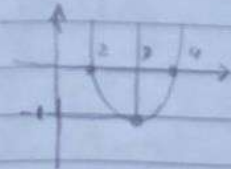
2-)

$$a-) y = x^2 - 6x + 8$$

$$x = \frac{-b}{2a} = \frac{-(-6)}{2 \cdot 1} = 3$$

$$y = \frac{c}{a} - \frac{b^2}{4a} = \frac{8}{1} - \frac{36}{4} = 8 - 9 = -1$$

$$\left. \begin{array}{l} x_1 + x_2 = 6 \\ x_1 \cdot x_2 = 8 \end{array} \right\} \Rightarrow \begin{array}{l} x_1 = 2 \\ x_2 = 4 \end{array} \quad \begin{array}{l} y_1 = 3 \\ y_2 = -1 \end{array}$$





b-)  $y = -2x^2 + 4x$

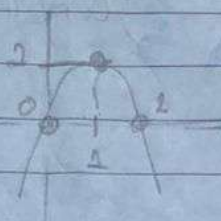
$\Delta = 16$

$x_1 = 0$

$x_v = 1$

$x_2 = +2$

$y_v = 2$



c-)  $y = x^2 - 4x + 4$

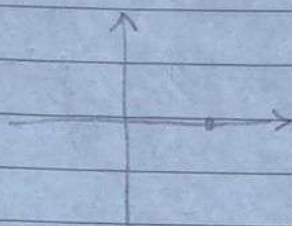
$\Delta = 0$

$x_1 = 2$

$x_v = +2$

$x_2 = 2$

$y_v = 0$



d-)  $y = (x-3)(x+2)$

$y = x^2 - x - 6$

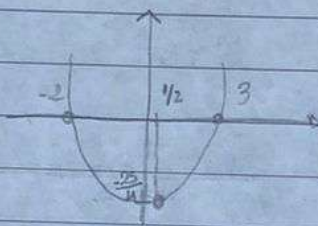
$\Delta =$

$x_1 = 3$

$x_v = \frac{1}{2}$

$x_2 = -2$

$y_v = -\frac{25}{4}$



e-)  $y = -x^2 + \frac{1}{4}$

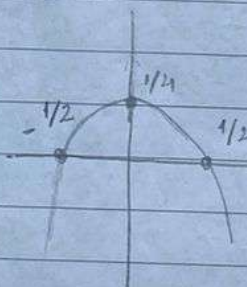
$\Delta = 1$

$x_1 = -\frac{1}{2}$

$x_v = 0$

$x_2 = \frac{1}{2}$

$y_v = \frac{1}{4}$



f-)  $y = -3x^2$

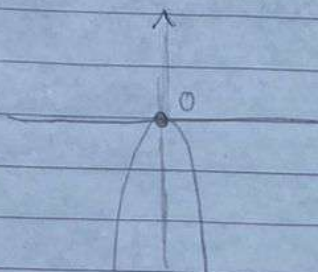
$\Delta = 0$

$x_1 = 0$

$x_v = 0$

$x_2 = 0$

$y_v = 0$





$$6-1) y = -2x^2 + 4x - 5$$

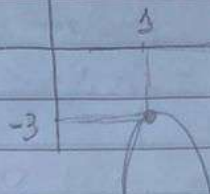
$\Delta =$  Delta negativo

Equação não possui raiz

$$x_v = 1$$

$$y_v = -3$$

$$\text{Im} \{ y \} = -3$$



$$h-1) y = 4x^2 - 2x$$

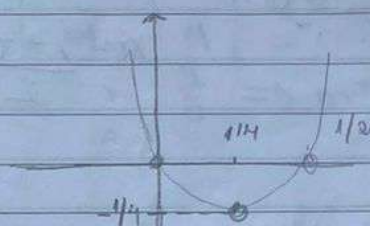
$$\Delta = 4$$

$$x_1 = 1/2$$

$$x_v = +1/4$$

$$x_2 = 0$$

$$y_v = -1/4$$



$$\text{Im} \{ y \} = -1/4$$

3-1

$$a-1) x^2 - 3\sqrt{3}x + 6$$

$$x = \frac{3\sqrt{3} \pm \sqrt{3}}{2}$$

$$\Delta = (-3\sqrt{3})^2 - 4 \cdot 1 \cdot 6$$

$$\Delta = (9 \cdot 3) - 24$$

$$\Delta = 27 - 24 = 3$$

$$x_1 = \frac{3\sqrt{3} - (1\sqrt{3})}{2} = \frac{2\sqrt{3}}{2} = \sqrt{3}$$

$$x_2 = \frac{3\sqrt{3} + (1\sqrt{3})}{2} = \frac{4\sqrt{3}}{2} = 2\sqrt{3}$$

$$b-1) 2(x+3)^2 - 5(x+3) + 2 = 0$$

$$x = \frac{-7 \pm \sqrt{9}}{2}$$

$$2(x^2 + 6x + 9) - 5x - 15 + 2 = 0$$

$$2 \cdot 2$$

$$2x^2 + 12x + 18 - 5x - 15 + 2 = 0$$

$$2x^2 + 7x + 5 = 0$$

$$x_1 = \frac{-7 + 3}{4} = \frac{-4}{4} = -1$$

$$\Delta = (7)^2 - 4 \cdot 2 \cdot 5$$

$$\Delta = 49 - 40$$

$$\Delta = 9$$

$$x_2 = \frac{-7 - 3}{4} = \frac{-10}{4} = -\frac{5}{2}$$



$$C) x + \frac{1}{x} = 3$$

$$x + \frac{1}{x} - 3 = 0$$

$$\frac{x^2 + 1 - 3x}{x} = 0$$

$$x^2 - 3x + 1 = 0$$

$$\Delta = (3)^2 - 4 \cdot 1 \cdot 1$$

$$\Delta = 9 - 4 = 5$$

$$x = \frac{3 \pm \sqrt{5}}{2}$$

$$x_1 = \frac{3 + \sqrt{5}}{2} \quad x_2 = \frac{3 - \sqrt{5}}{2}$$

$$d-) (-x^2 + 1)(x^2 - 3x + 2)$$

I      II

$$S = \{1, 2, -1, 2\}$$

$$I) -x^2 + 1$$

$$\Delta = 4$$

$$x_1 = 1 \quad x_2 = -1$$

$$II) x^2 - 3x + 2$$

$$\Delta = 1$$

$$x_1 = 2 \quad x_2 = 1$$

$$E-) x^3 + 10x^2 + 21x = 0$$

$$\Delta = 16 \quad x_1 = -3, \quad x_2 = -7$$

$$x(x^2 + 10x + 21) = 0$$

expressão fatorada

I-) Binômio

$$(x - 0)(x - (-3))(x - (-7))$$

$$x(x + 3)(x + 7)$$

$$S = \{-3, -7, 0\}$$

$$f-) x^4 - 5x^2 + 4 = 0$$

$$(x^2)^2 - 5x^2 + 4 = 0$$

$$y_1 = 4, \quad y_2 = 1$$

troque Y por  $x^2$

troque X por Y

$$y^2 - 5y + 4 = 0$$

$$y = 4 \Rightarrow x^2 = 4 \Rightarrow x = \sqrt{4} \Rightarrow x = \pm 2$$

$$y = 1 \Rightarrow x^2 = 1 \Rightarrow x = \sqrt{1} \Rightarrow x = \pm 1$$

$$\Delta = 9$$

$$S = \{-2, -1, 1, 2\}$$



$$4.) f(x) = x^2 - 4x + (m+3)$$

$A=1, B=-4, C=(m+3)$	$\Delta > 0 \rightarrow 2 \text{ raiz}$
	$\Delta = 0 \rightarrow 1 \text{ " "}$
	$\Delta < 0 \rightarrow \text{não possui}$

$$\Delta = (-4)^2 - 4 \cdot 1 \cdot (m+3)$$

$$\Delta = +16 - 4(m+3)$$

$$\Delta = 16 - 4m - 12$$

$$\Delta = 4 - 4m$$

$$\Delta > 0$$

$$4 - 4m > 0$$

$$-4m > -4 \cdot (-1)$$

$$4m < 4$$

$$m < \frac{4}{4} \Rightarrow m < 1$$

$\therefore m < 1 \Rightarrow 2 \text{ Raizes}$

$m = 1 \Rightarrow 1 \text{ Raiz}$

$m > 1 \Rightarrow \text{não possui raiz}$

5.)

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

$$\left. \begin{aligned} x_1 + x_2 &= -\frac{b}{a} = -\frac{-3}{1} = 3 \\ x_1 \cdot x_2 &= \frac{c}{a} = \frac{2}{1} = 2 \end{aligned} \right\} \Rightarrow \begin{aligned} x_1 &= 2 \\ x_2 &= 1 \end{aligned}$$

$$f(x) = x(x-2)(x-1)$$

b.)  $f(x) = x^2 - x - 2$

$$\left. \begin{aligned} x_1 + x_2 &= \frac{1}{1} = 1 \\ x_1 \cdot x_2 &= \frac{-2}{1} = -2 \end{aligned} \right\} \Rightarrow \begin{aligned} x_1 &= 2 \\ x_2 &= -1 \end{aligned}$$

$$f(x) = x(x-2)(x-(-1))$$

$$= x(x-2)(x+1)$$

c.)  $f(x) = x^2 - 6x + 9$

$$\left. \begin{aligned} x_1 + x_2 &= -\frac{(-6)}{1} = 6 \\ x_1 \cdot x_2 &= \frac{9}{1} = 9 \end{aligned} \right\} \Rightarrow \begin{aligned} x_1 &= 3 \\ x_2 &= 3 \end{aligned}$$

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

$$= x(x-3)^2$$

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

$\Delta = 1$

$x_1 = \frac{1}{2}$

$x_2 = \frac{1}{2}$

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



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

$$\Delta = 25$$

$$x_1 = +1$$

$$x_2 = -\frac{4}{6} = -\frac{2}{3}$$

$$f(x) = 3(x - (-\frac{4}{6}))(x - 1)$$

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

Resposta final  
diferente de  $x^2$

6-) Uma das raízes da equação  $x^2 - 25x + 24 = 0$   
(Como é do segundo grau tem duas raízes) excede  
a outra em 3 unidades (ou seja uma das  
raízes é igual a outra + 3)

$$x_1 = x$$

$$x_2 = x + 3$$

$$x_1 + x_2 = -\frac{b}{a} + \frac{25}{1} = 25$$

$$x_1 + x_2 = 25$$

$$x + (x + 3) = 25$$

$$2x = 25 - 3$$

$$x = \frac{22}{2}$$

$$x_1 = 11$$

$$x_2 = x + 3$$

$$11 + 3$$

$$x_2 = 14$$

$$7-) \text{valor máximo} = y_v = -\frac{\Delta}{4a} = 2$$

$$a = -3, b = 2m - 2, C = m + 1$$

$$\Delta = (2m - 2)^2 - 4(-3)(m + 1)$$

$$\Delta = 4m^2 - 8m + 4 + 12(m + 1)$$

$$\Delta = 4m^2 - 8m + 4 + 12m + 12$$

$$\Delta = 4m^2 + 4m + 16$$

$$y_v = \frac{m^2 + m + 4}{3}$$

$$y_v = \frac{m^2 + m + 4}{3} = 2$$

$$y_v = \frac{-(4m^2 + 4m + 16)}{-12}$$

$$y_v = m^2 + m + 4 = 6$$

$$y_v = m^2 + m - 2 = 0$$

$$y_v = \frac{4m^2 + 4m + 16}{12} = 4$$

$$\begin{cases} m_1 + m_2 = -1 \\ m_1 \cdot m_2 = -2 \end{cases} \begin{cases} x_1 = -2 \\ x_2 = 1 \end{cases}$$



os números  $x$  e  $z$  de soma = 6  
 8-1)  $x + z = 6$   
 $z = 6 - x$

a soma dos quadrados desses números é

$$S = x^2 + z^2$$

Substitui o valor de  $z$  em  $S$

$$S = x^2 + (6 - x)^2$$

$$S = x^2 + 36 + 12x + x^2$$

$$S = 2x^2 + 12x + 36$$

Como queremos que a soma seja mínima  
 calculamos o  $X_v = -\frac{b}{2a} = -\frac{12}{4} = -3$

Logo  $x = 3$  então  $z = 6 - 3 = 3$

9-1)



①

$$P = 2(x + y) = 20$$

$$2x + 2y = 20 : 2$$

$x = h$  e  $y = b$

forma simplificada:

$$x + y = 10$$

4 - não pense!

$$A = b \cdot h$$

③

$$x + y = 10$$

$$y = 10 - x$$

$$A = x \cdot (10 - x)$$

④

$$A = 10x - x^2$$

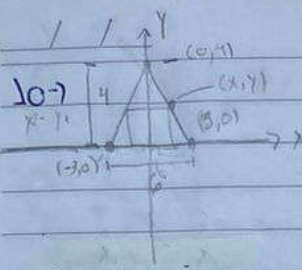
$$A = -x^2 + 10x$$

⑤ área máxima =  $X_v$

$$X_v = -\frac{10}{-2} = 5$$

quadrado de lado 5cm





$$A(x,y) = y \cdot 2x$$

$$y - y_0 = a(x - x_0)$$

↳ coeficiente angular

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 4}{3 - 0} = -\frac{4}{3}$$

4) escreva 1 dos pontos (0,4)

$$y - 4 = -\frac{4}{3} \cdot (x - 0)$$

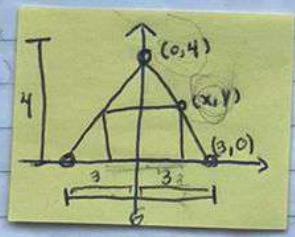
$$y = 4 - \frac{4}{3} \cdot x \implies y = 4 - \frac{4}{3}x$$

$$A(x) = y \cdot 2x$$

$$A(x) = \left(4 - \frac{4}{3}x\right) \cdot 2x \implies A(x) = 8x - \frac{8}{3}x^2$$

$$A(x) = 8x - \frac{8}{3}x^2$$

$$x_v = \frac{-b}{2a} = \frac{-8}{2 \cdot \left(-\frac{8}{3}\right)}$$



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

$$x_v = \frac{3}{2} \quad x = \frac{3}{2}$$

$$A_1 = 3 \quad A_2 = 2$$



$$y = \frac{1}{50}x^2 + 0,72x = 0$$

$$x(-1x + 0,72) = 0$$

$$x = 0 \text{ or } -1x + 0,72 = 0$$

$$\frac{-1}{50}x = -0,72 \quad (-1) \cdot (-1)$$

$$\frac{1}{50}x = 0,72$$

$$x = 0,72 \cdot 50$$

$$x = 36$$

$$F_0 = 0,004001$$

$$F_1 = 0,004001 + 0,004001 = 0,008002$$

$$F_2 = 0,008002 + 0,008002 = 0,016004$$

$$F_3 = 0,016004 + 0,016004 = 0,032008$$

$$F_4 = 0,032008 + 0,032008 = 0,064016$$

$$F_5 = 0,064016 + 0,064016 = 0,128032$$

$$F_6 = 0,128032 + 0,128032 = 0,256064$$



$$11-7) f(x) = x^2 - 4x + 4$$

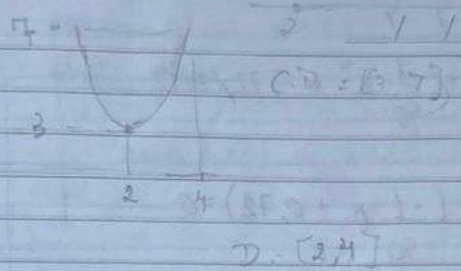
$$\Delta = (1)^2 - 4 \cdot 1 \cdot 4$$

$$\Delta = 16 - 28$$

$$\Delta = -12$$

$$x_v = \frac{-b}{2a} = \frac{4}{2} = 2$$

$$y_v = \frac{-\Delta}{4 \cdot a} = \frac{12}{4} = 3$$



$$12-) y = \frac{-1}{50} x^2 + cx \Rightarrow 400/1000 = 0,7$$

$$0,7 = \frac{-1}{50} x^2 + c \cdot 1 \Rightarrow 0,7 + \frac{1}{50} = c$$

$$c = \frac{0,7}{1} + \frac{1}{50} = \frac{35}{50} + \frac{1}{50} = \frac{36}{50} = 0,72$$

$$y = -\frac{1}{50} x^2 + 0,72x$$

$$x_v = \frac{-b \pm \sqrt{\Delta}}{2 \cdot a} = \frac{-0,72 \pm \sqrt{0,72^2 - 2 \cdot \frac{1}{50}}}{2 \cdot (-\frac{1}{50})} = \frac{0,72 \pm \sqrt{0,5184 - 0,4}}{-0,02} = \frac{0,72 \pm \sqrt{0,1184}}{-0,02} = \frac{0,72 \pm 0,344}{-0,02}$$

$$y = -\frac{1}{50} \cdot 18^2 + 0,72 \cdot 18 \quad | \quad 6,48 \cdot 1000 = 6480$$

$$y = -\frac{1}{50} \cdot 324 + 12,96$$

$$y = -\frac{324}{50} + 12,96$$

$$y = -6,48 + 12,96$$

$$y = 6,48$$



3) a)  $x^2 - 3x + 2 > 0$

$x_1 + x_2 = 3 \quad \left\{ \begin{array}{l} x_1 = 2 \\ x_2 = 1 \end{array} \right.$

$x_1 \cdot x_2 = 2 \quad \left\{ \begin{array}{l} x_1 = 2 \\ x_2 = 1 \end{array} \right.$

estudo sinal  $x > 0$

1 1

$S = \{x \in \mathbb{R} \mid x < 1 \text{ ou } x > 2\}$

b)  $-3x^2 - 8x + 3 \leq 0$

$D = 100$

$x_1 = \frac{1}{3} \quad x_2 = -3$



$S = \{x \in \mathbb{R} \mid x < -3 \text{ ou } x > \frac{1}{3}\}$

c)  $(x^2 - x - 2)(-x^2 + 4x - 3) > 0$

$x_1 + x_2 = 4 \quad \left\{ \begin{array}{l} x_1 = 2 \\ x_2 = -1 \end{array} \right.$

$x_1 \cdot x_2 = -2 \quad \left\{ \begin{array}{l} x_1 = 2 \\ x_2 = -1 \end{array} \right.$

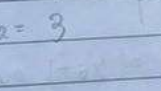


$S = \{x \in \mathbb{R} \mid -1 < x < 2 \text{ ou } 2 < x < 3\}$

d)  $(x^2 - x - 6)(-x^2 - 2x + 3) > 0$

$x_1 + x_2 = -1 \quad \left\{ \begin{array}{l} x_1 = -3 \\ x_2 = 2 \end{array} \right.$

$x_1 \cdot x_2 = 6 \quad \left\{ \begin{array}{l} x_1 = -3 \\ x_2 = 2 \end{array} \right.$



$S = \{x \in \mathbb{R} \mid -3 < x < -1 \text{ ou } -1 < x < 2\}$

e)  $(x^2 - x - 6)(-x^2 - 2x + 3) > 0$

$x_1 + x_2 = -1 \quad \left\{ \begin{array}{l} x_1 = -3 \\ x_2 = 2 \end{array} \right.$

$x_1 \cdot x_2 = 6 \quad \left\{ \begin{array}{l} x_1 = -3 \\ x_2 = 2 \end{array} \right.$



$S = \{x \in \mathbb{R} \mid -3 < x < -1 \text{ ou } -1 < x < 2\}$

f)  $x_1 + x_2 = -2 \quad \left\{ \begin{array}{l} x_1 = -3 \\ x_2 = 1 \end{array} \right.$

$x_1 \cdot x_2 = -2 \quad \left\{ \begin{array}{l} x_1 = -3 \\ x_2 = 1 \end{array} \right.$



$S = \{x \in \mathbb{R} \mid -3 < x < -1 \text{ ou } -1 < x < 2\}$



$(e) x^3 - 2x^2 + x + 2 > 0$   
 $x^2(x-2) - 1(x+2) > 0$   
 $(x-2)(x^2-1) > 0$   
 $(x-2)(x-1)(x+1) > 0$   
 $x > 2$   
 $x > 1$   
 $x < -1$   
 $S = \{x < -1 \text{ ou } x > 2\}$

$(f) 2x^2 + x - 1 \leq 0$   
 $2x^2 - x^2$   
 $D = 9$   
 $x_1 = -1$   $x_2 = \frac{1}{2}$   
 $S = \{x \leq -1 \text{ ou } 0 \leq x \leq \frac{1}{2} \text{ ou } x \geq 2\}$

$(g) 4x^2 + x - 5 > 0$   
 $2x^2 - 3x - 2$   
 $D = 2$   
 $x_1 = 2$   $x_2 = -\frac{1}{2}$   
 $S = \{x < -\frac{5}{4} \text{ ou } -\frac{1}{2} < x \leq 1 \text{ ou } x \geq 2\}$

$(h) 4x^2 + x - 6 > 0$   
 $D = 81$   
 $x_1 = -1$   $x_2 = \frac{5}{4}$   
 $S = \{x < -1 \text{ ou } \frac{5}{4} < x \leq 1 \text{ ou } x \geq 2\}$

$(i) x^2 + 2x$   
 $x^2 + 5x + 6$   
 $x_1 = -2$   $x_2 = 0$   
 $S = \{x < -3 \text{ ou } x \geq 0\}$

$(i) x^2 + 3x - 10$   
 $-x^2 + 4x - 10$   
 $-x^2 + 9x - 16$   
 $-x^2 + 7x - 10$

$(j) 2x^2 - 4x - 6$   
 $D = 64$   
 $x_1 = -1$   $x_2 = 3$   
 $S = \{x \leq -1 \text{ ou } x \geq 3\}$

$(k) x^2 + 3x + 2$   
 $-x^2 + 4x - 10$   
 $-x^2 + 9x - 16$   
 $-x^2 + 7x - 10$

$(k) x - 3$   
 $x - 2$   
 $S = \{x - 3 \text{ ou } x - 2\}$

$(k) x - 3$   
 $x - 2$



$$i-) x^2 + 3x - 26 \geq 1 \Rightarrow \frac{x^2 + 3x - 16}{-x^2 + 7x - 10} - \frac{1}{1}$$

$$\Rightarrow \frac{x^2 + 3x - 16 + x^2 - 7x + 10}{-x^2 + 7x - 10} \Rightarrow \frac{2x^2 - 4x - 6}{-x^2 + 7x - 10} \geq 0$$

$$\textcircled{4} 2x^2 - 4x - 6 \geq 0$$

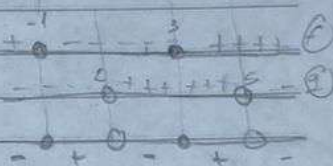
$$\Delta = 64$$

$$x_1 = -1 \quad x_2 = 3$$

$$\textcircled{5} -x^2 + 7x - 10 \geq 0$$

$$\Delta = 9$$

$$x_1 = 2 \quad x_2 = 5$$

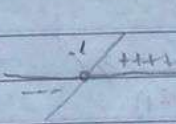


$$S = \{x \mid -1 \leq x < 2 \text{ or } 3 \leq x < 5\}$$

$$j-) \frac{x+1}{x^2 - 3x + 2} \geq 0$$



$$\textcircled{6} \frac{x+1}{x-1} \geq 0$$



$$\textcircled{7} \frac{x^2 - 3x + 2}{x-1} \geq 0$$

$$\Delta = 1$$

$$x_1 = 2 \quad x_2 = 1$$



$$S = \{x \mid -1 \leq x < 1 \text{ or } x > 2\}$$

$$k-) \frac{x-3}{x-2} \leq x-1 \Rightarrow \frac{x-3}{x-2} - \frac{(x-1)(x-2)}{x-2} \leq 0$$

$$\Rightarrow \frac{x-3 - (x-2)(x-1)}{x-2} \Rightarrow \frac{x-3 - (x^2 - 3x + 2)}{x-2} \Rightarrow \frac{-x^2 + 4x - 5}{x-2} \leq 0$$

$$\Rightarrow \frac{-x^2 + 4x - 5}{x-2} \leq 0$$



1 / 1

(f)  $-x^2 + 4x - 9 \leq 0$

$\Delta = -4$

(g)  $x - 2 \leq 0$

$x \leq 2$



$x > 2$

(-1)  $\frac{x}{(x+1)} - \frac{x}{(x-1)} \geq 0 \Rightarrow \frac{x(x-1) - x(x+1)}{(x+1)(x-1)} \geq 0$

$\frac{x^2 - x - x^2 - x}{(x+1)(x-1)} \geq 0 \Rightarrow \frac{-2x}{(x+1)(x-1)} \geq 0$

(f)  $-2x \geq 0$  (f)  $x+1 \geq 0$  (h)  $x-1 \geq 0$   
 $x \geq 0$  (f)  $x \geq -1$   $x \geq 1$

