

Functions:

23 f is the function such that $f(x) = (x+1)^2$ for $x > 0$

h is the function such that $hf(x) = x$ for all $x > 1$

(c) Find the function h in the form $h(x) = \dots$

$$h[(x+1)^2]$$

$$h(x) = \sqrt{x} - 1$$

17 The functions g and h are such that

$$g(x) = \frac{11}{2x-5}$$

$$h(x) = x^2 + 4 \quad x \geq 0$$

(b) Solve $gh(x) = 1$

Handwritten solution for part (b):

$$b) gh(x) = g(x^2+4) = \frac{11}{2(x^2+4)-5}$$

$$g(x^2+4) = \frac{11}{2x^2+8-5}$$

$$x^2+4 \times 2x^2+3 = 11$$

$$2x^4 + 12 = 11$$

$$2(x^4+6) = 11$$

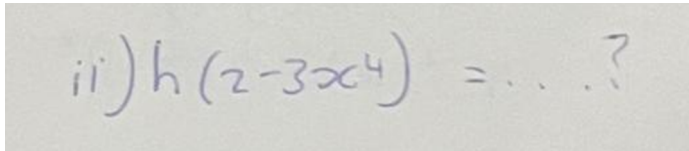
$$\div \quad ?$$

$$\frac{11}{2x^2-3} = 1$$

The function g is such that $g(x) = 2 - 3x^4$ where $x \neq 0$

The function h is such that $h(x) = \frac{3x}{2-x}$ where $x \neq 2$

- (ii) Express the composite function hg in the form $hg(x) = \dots$
Give your answer in its simplest form.



Handwritten equation: $ii) h(2-3x^4) = \dots ?$

19 $f(x) = x^2 - 4$

$g(x) = 2x + 1$

Solve $fg(x) > 0 \rightarrow 4x^2 + 4x - 3 > 0$

Show clear algebraic working.

19) $f(2x+1) = x^2 - 4(2x+1)^2 - 4$
 $\frac{1}{2} \cdot 2x+1$
 $f(4x^2+4x+1) - 4 = 0$
 $= 4x^2 + 4x - 3 = 0$
 $= (2x-1)(2x+3) = 0$
 $x = \frac{1}{2}$
 $x = -\frac{3}{2}$

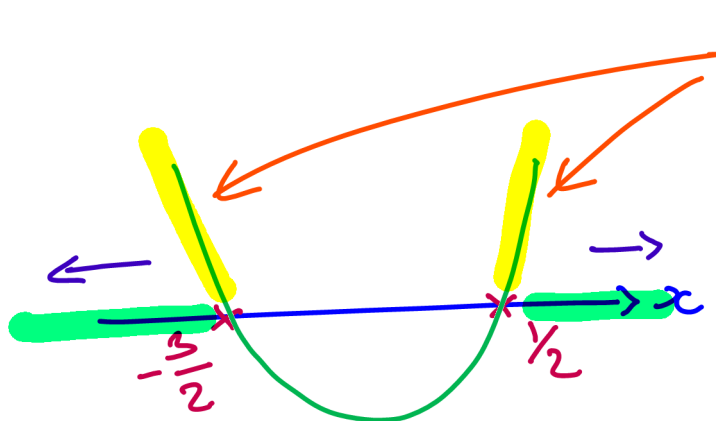
$2x-1=0$

$2x+3=0$

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

$x = -\frac{3}{2}$

$4x^2 + 4x - 3 > 0$



These portions of the graph have positive 'y'-coord. (> 0)

$x < -\frac{3}{2}$ or $x > \frac{1}{2}$

3 On the grid, identify the region represented by

$x > 1$

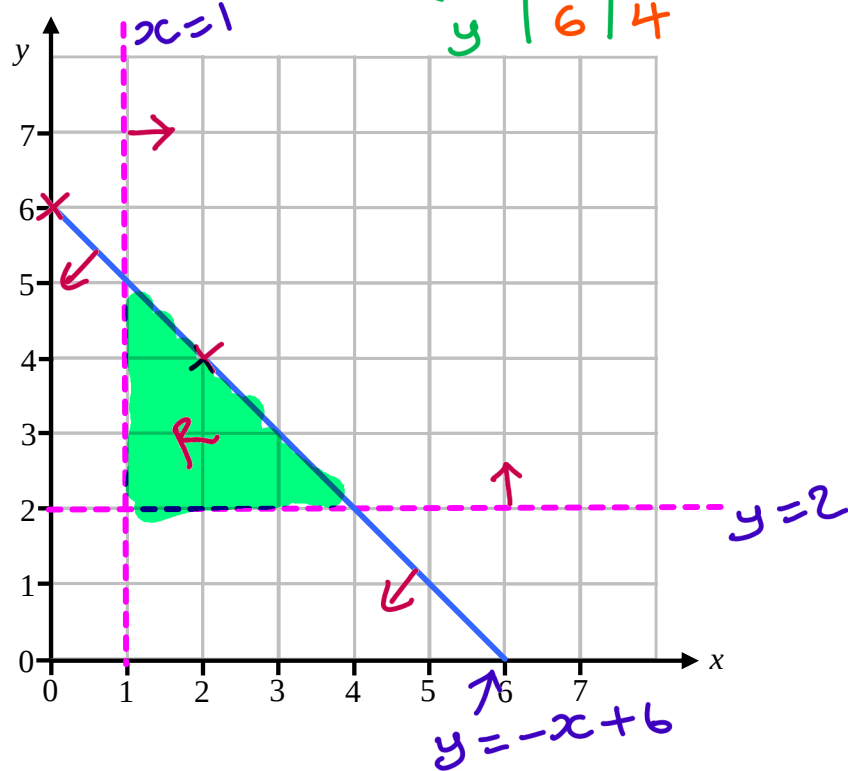
$y > 2$

$x + y \leq 6$

$y \leq -x + 6$

x	0	2
y	6	4

Label the region R.



(Total for Question 3 is 3 marks)

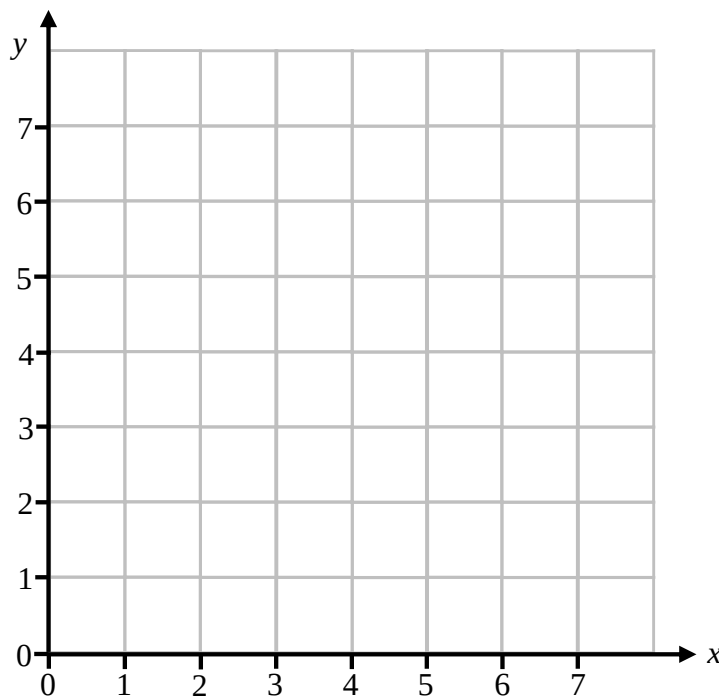
4 On the grid, identify the region represented by

$x \geq 2$

$y \geq 4$

$y \leq x + 3$

Label the region R.



(Total for Question 4 is 3 marks)





5 On the grid, identify the region represented by

$$y \geq -1$$

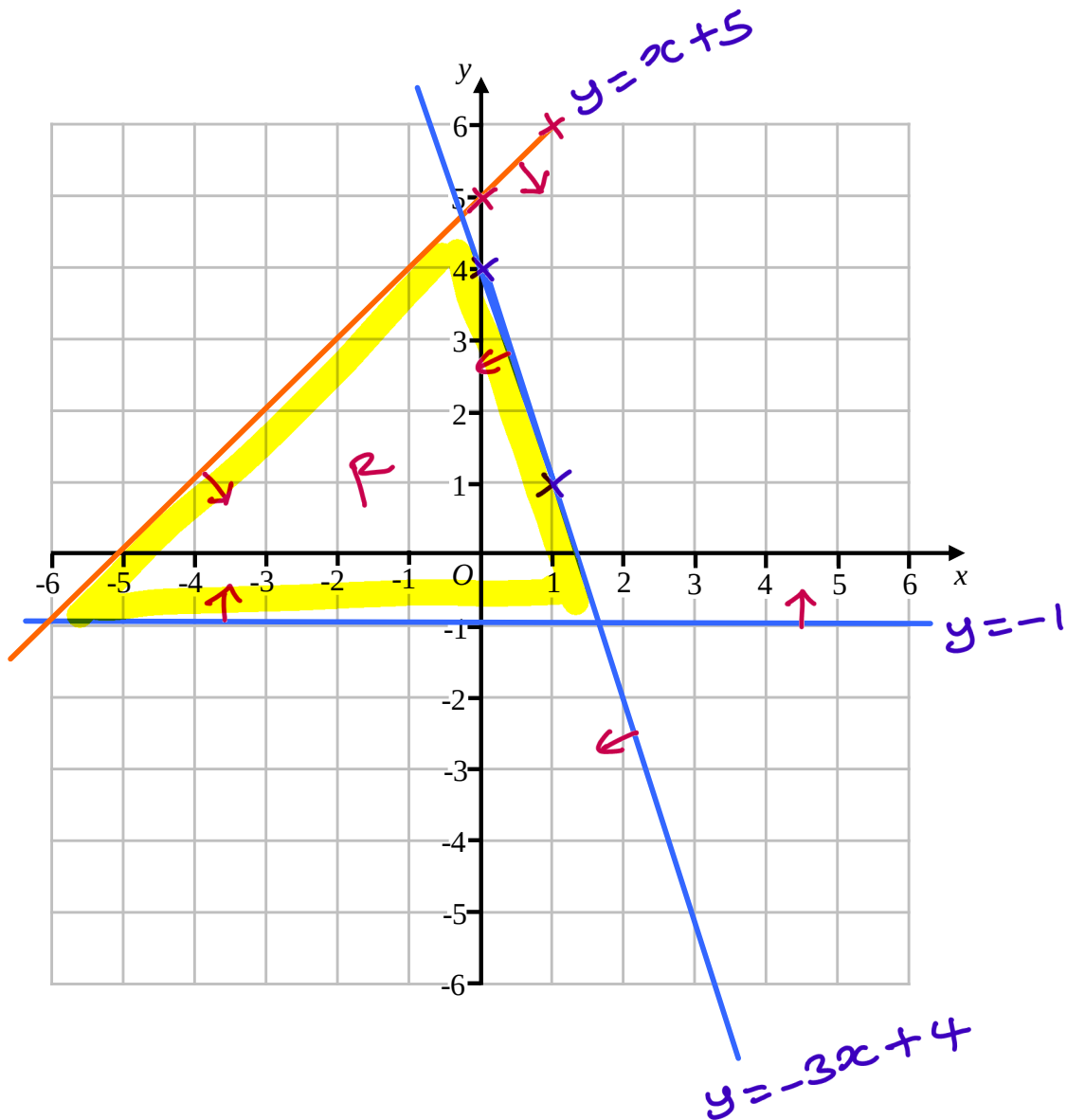
$$y \leq x + 5$$

$$y \leq 4 - 3x$$

Label the region R.

x	0	1
y	5	6

x	0	1
y	4	1



(Total for Question 5 is 3 marks)



7 On the grid, identify the region represented by

$$x > -4 \quad y > \frac{1}{2}x - 1 \quad x + 2y \leq 6 \rightarrow y \leq \frac{-x + 6}{2}$$

Label the region R.

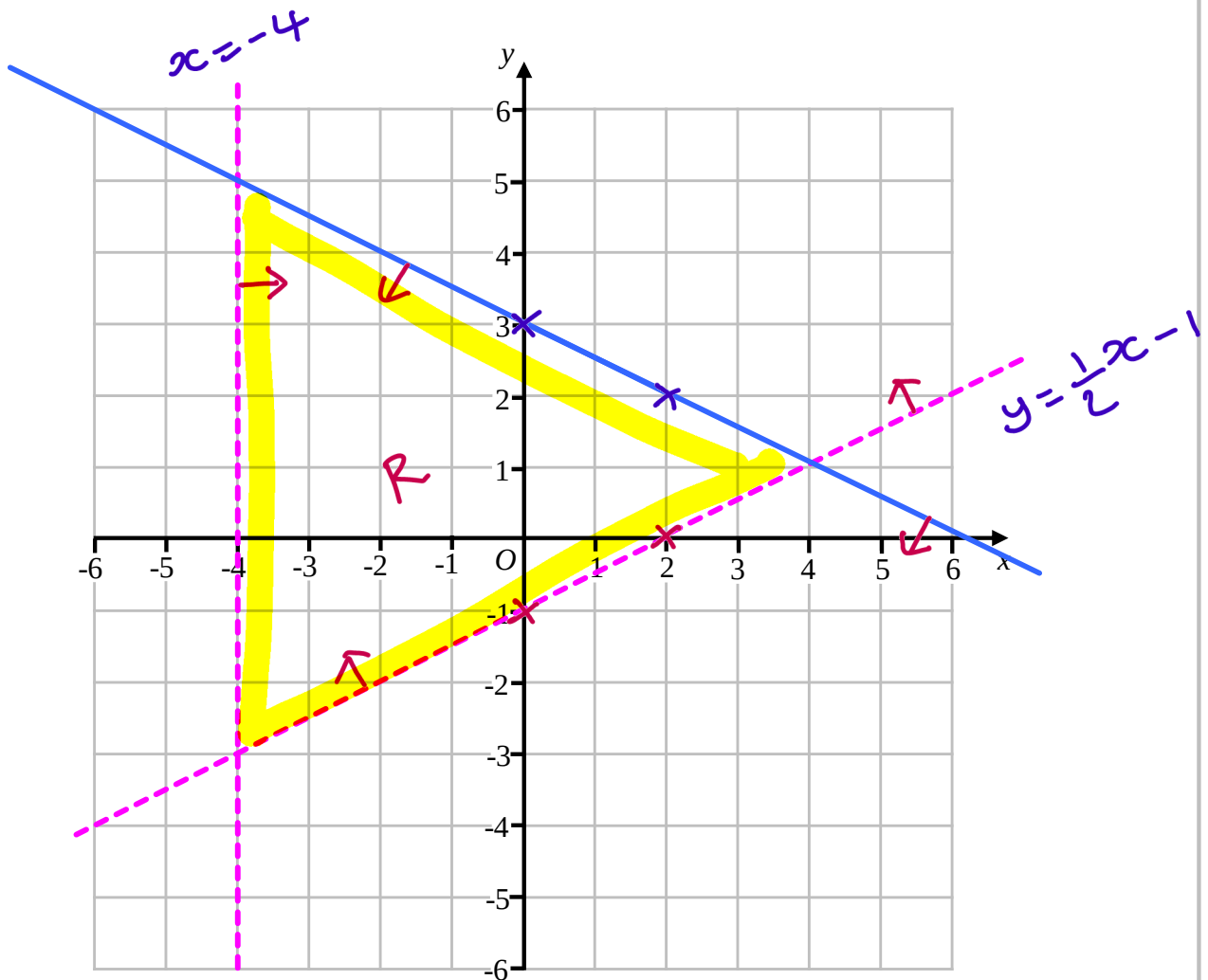
$\downarrow$
 $x = -4$

$\downarrow$

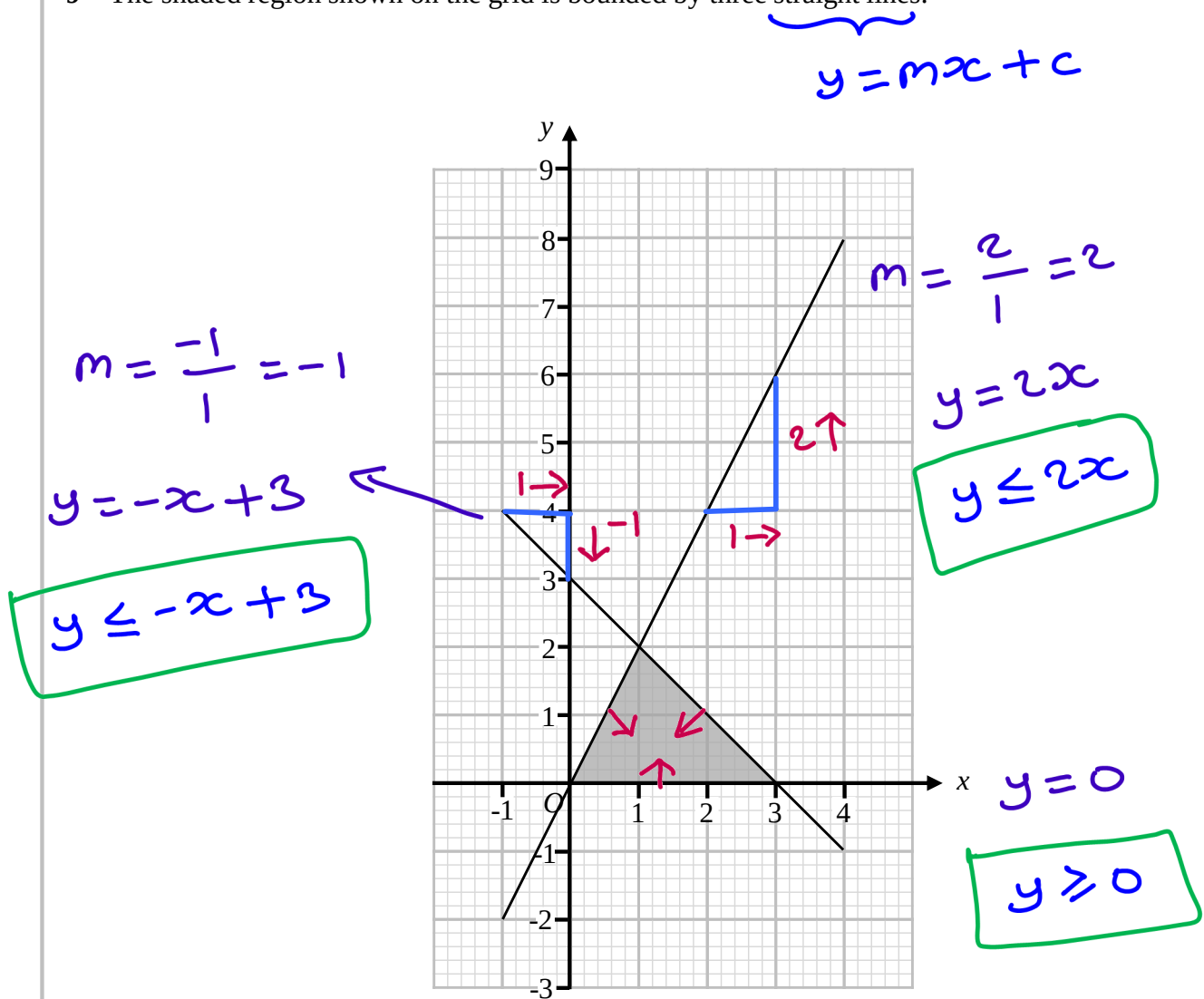
x	0	2
y	-1	0

$\downarrow$

x	0	2
y	3	2



9 The shaded region shown on the grid is bounded by three straight lines.



Write down the three inequalities that define the region.

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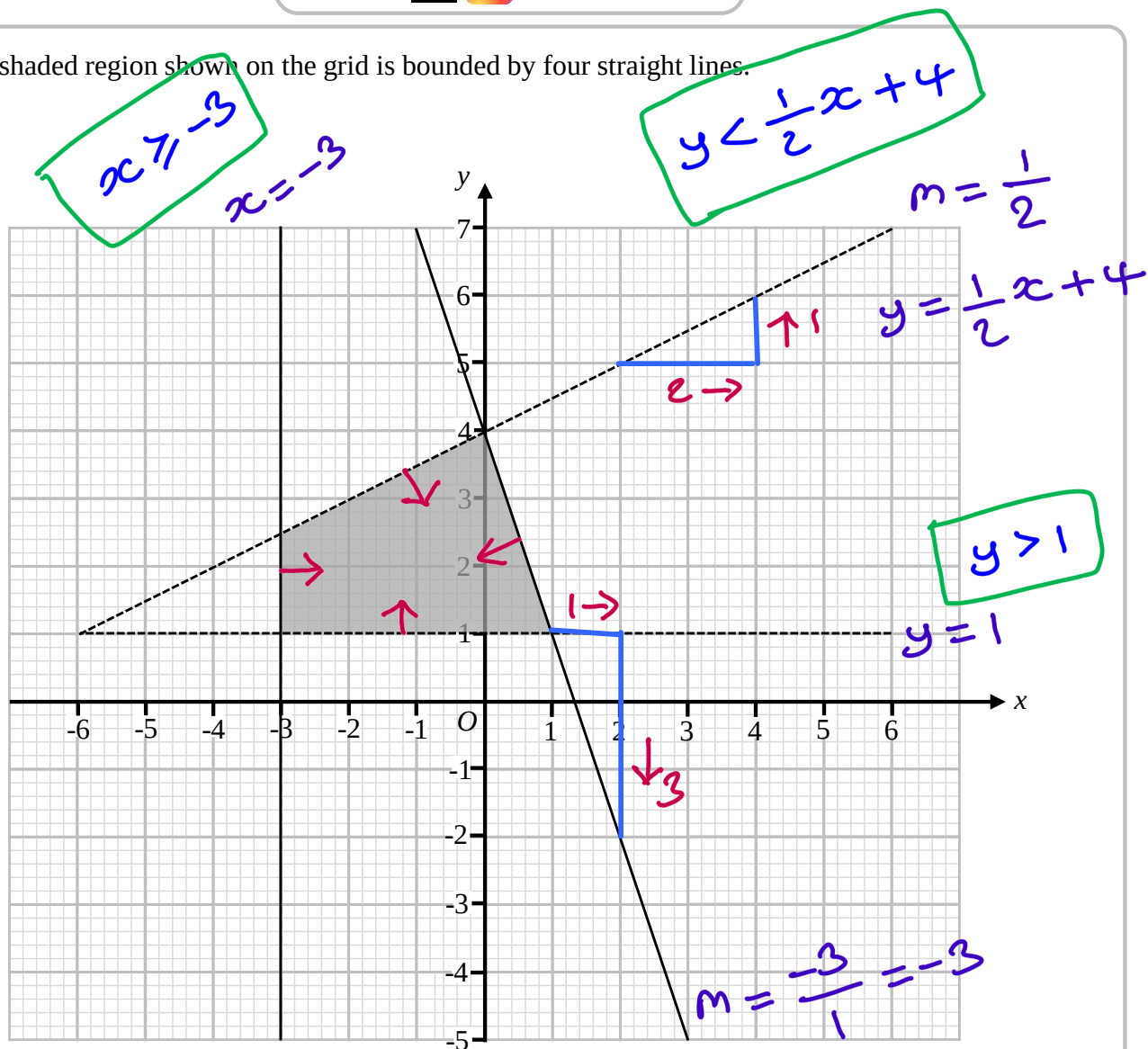
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(Total for Question 9 is 3 marks)



11 The shaded region shown on the grid is bounded by four straight lines.



Write down the four inequalities that define the region.

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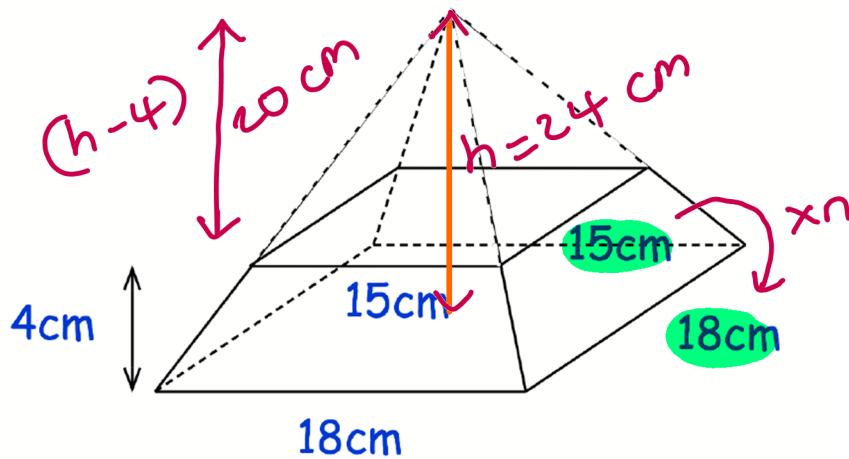
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(Total for Question 11 is 4 marks)



Volumes of Frustums:

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$$n = \frac{18}{15} = \frac{6}{5}$$

$$\text{Vol.} = \frac{1}{3} \times \text{base area} \times \text{height}$$

$$\cancel{(h-4)} \times \frac{h}{\cancel{h-4}} = \frac{6}{5} \times (h-4)$$

$$5 \times h = \frac{6h - 24}{\cancel{5}} \times \cancel{5}$$

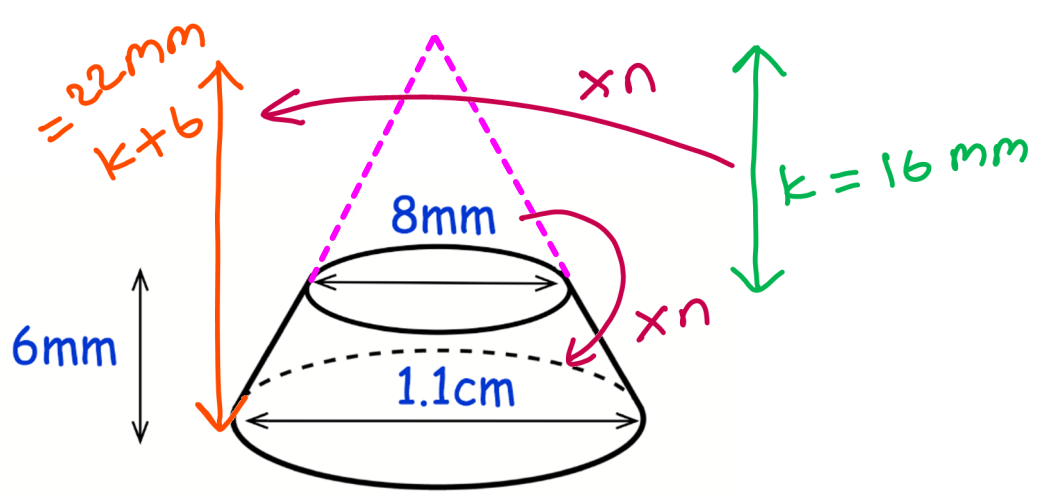
$$\cancel{5h} = 6h - 24$$
$$-5h$$

$$24 = h$$

$$V_{\text{Frust}} = \frac{1}{3} \times 18^2 \times 24 - \frac{1}{3} \times 15^2 \times 20$$
$$= 1092 \text{ cm}^3$$

✳

$$n = \frac{11}{8}$$



$$\text{Vol.} = \frac{1}{3} \times \text{base area} \times \text{height}$$

$$k \times \frac{11}{8} = k + 6$$

$$\cancel{8} \times \frac{11k}{\cancel{8}} = (k + 6) 8$$

$$11k = \cancel{8k} + 48$$

$$-8k$$

$$\cancel{3k} = \frac{48}{3}$$

$$k = 16$$

$$V_{\text{large}} = \frac{1}{3} \times \pi \times 5.5^2 \times 22 = \frac{1331\pi}{6} \text{ mm}^3$$

$$V_{\text{small}} = \frac{1}{3} \times \pi \times 4^2 \times 16 = \frac{256\pi}{3} \text{ mm}^3$$

$$V_F = \frac{1331\pi}{6} - \frac{256\pi}{3}$$

$$V_F = \frac{1075\pi}{3} \text{ mm}^3$$