

WORKING WITH FUNCTIONS

- 1 If $f(x) = x^2 + 7$ and $g(x) = 5 - 2x$, then the correct expression for $f(x) + g(x)$ is:

A $x^2 + 2x + 12$ **B** $x^2 - 2x + 12$ C $x^2 - 2x + 2$ D $x^2 + 2x + 2$

$$f(x) + g(x) = x^2 + 7 + (5 - 2x) = x^2 - 2x + 12$$

- 2 If $f(x) = x^2 + 7$ and $g(x) = 5 - 2x$, then the correct expression for $f(x) \cdot g(x)$ is:

A $2x^3 - 5x^2 + 14x - 35$ B $x^2 - 2x + 12$ C $-2x^3 - 5x^2 + 14x + 35$ **D** $-2x^3 + 5x^2 - 14x + 35$

$$f(x) \cdot g(x) = (x^2 + 7)(5 - 2x) = 5x^2 - 2x^3 + 35 - 14x$$

- 3 If $f(x) = x^2 + 7$ and $g(x) = 5 - 2x$, then the correct expression for $f(g(x))$ is:

A $4x^2 - 20x + 32$ B $-2x^2 - 9$ C $4x^2 + 32$ D $x^2 + 2x + 2$

$$f(g(x)) = [5 - 2x]^2 + 7 = 25 - 20x + 4x^2 + 7 = 4x^2 - 20x + 32$$

- 4 If $f(x) = x + 4$, $g(x) = x^2 - 6$, find expressions for each of the following functions, stating the domain and range in each case.

(a) $f(x) + g(x)$ (b) $f(x) - g(x)$

a) $f(x) + g(x) = x + 4 + x^2 - 6 = x^2 + x - 2$ domain $\mathbb{R}$
range $[-2.25, +\infty)$

b) $f(x) - g(x) = x + 4 - (x^2 - 6) = -x^2 + x + 10$

domain $\mathbb{R}$

~~axis~~ axis is $x = \frac{-1}{2 \times (-1)} = \frac{1}{2}$

For $x = \frac{1}{2}$ $y = -\left(\frac{1}{2}\right)^2 + \frac{1}{2} + 10 = 10.25$ So Range $(-\infty, 10.25]$

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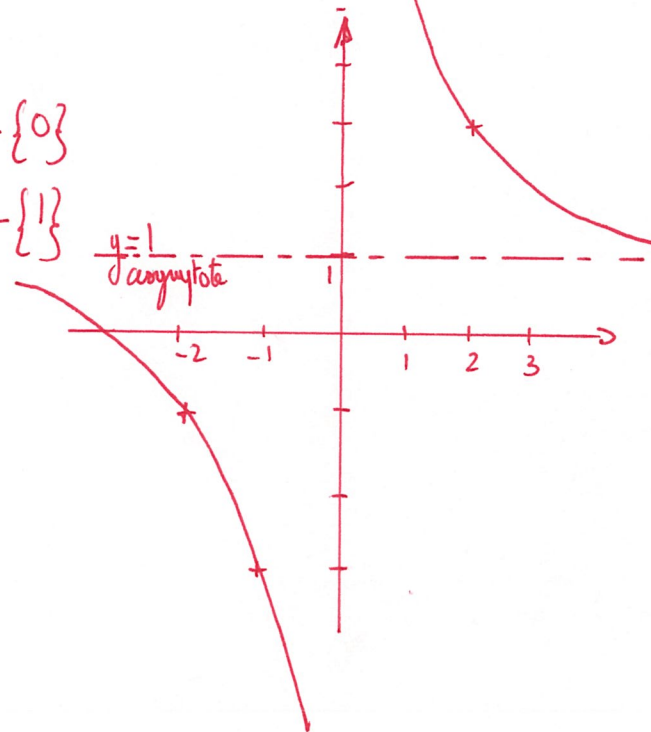
- 6 If $f(x) = x$, $g(x) = x + 4$, find expressions for each of the following functions, stating the domain and range in each case. Use technology to sketch the new function.

(a) $f(x) \cdot g(x)$ (b) $\frac{g(x)}{f(x)}$ (c) $\frac{f(x)}{g(x)}$

a) $f(x) \cdot g(x) = x \times (x + 4) = x^2 + 4x$ Domain $\mathbb{R}$

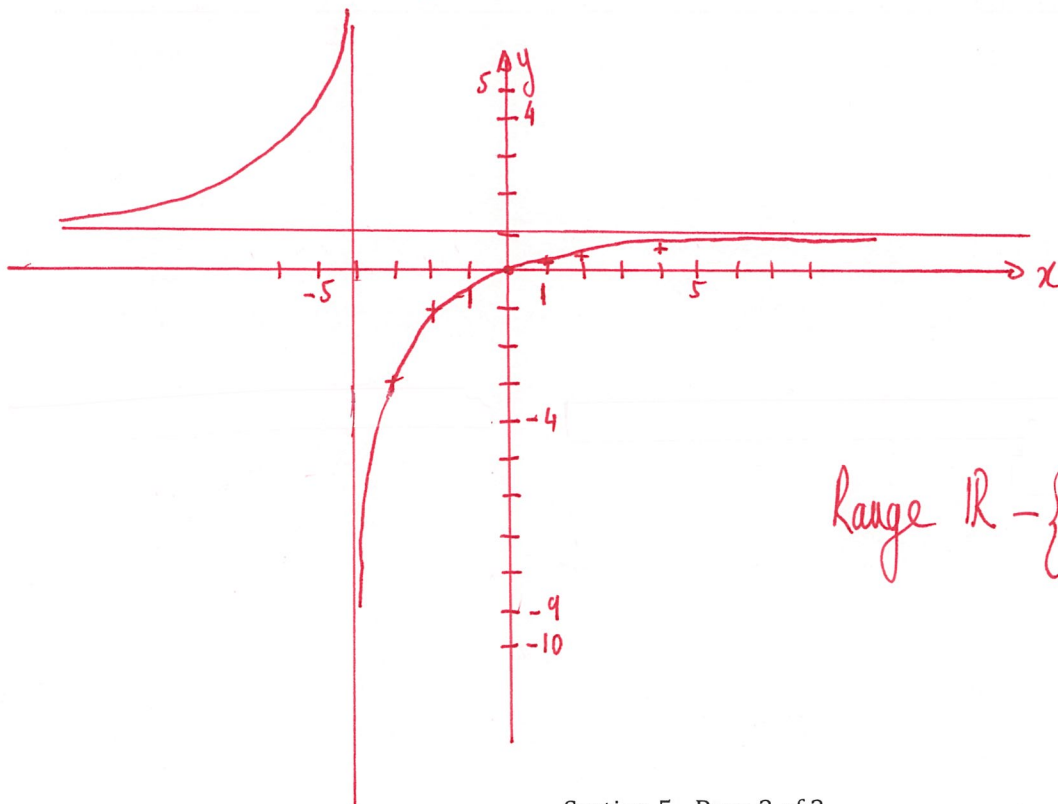
axis is $x = -\frac{4}{2} = -2$ for $x = -2$, $f(-2) \cdot g(-2) = (-2)^2 + 4 \times (-2) = -4$
So Range is $[-4, +\infty)$

b) $\frac{g(x)}{f(x)} = \frac{x+4}{x}$ Domain $\mathbb{R} - \{0\}$
Range $\mathbb{R} - \{1\}$



c) $\frac{f(x)}{g(x)} = \frac{x}{x+4}$

Domain $\mathbb{R} - \{-4\}$



Range $\mathbb{R} - \{1\}$