

Resource for Day 7 – **FUN**ctions – Thursday 26 October

1. Given the following functions:

$$f(x) = x + 6$$

$$g(x) = x^2$$

$$h(x) = 2^x + 3$$

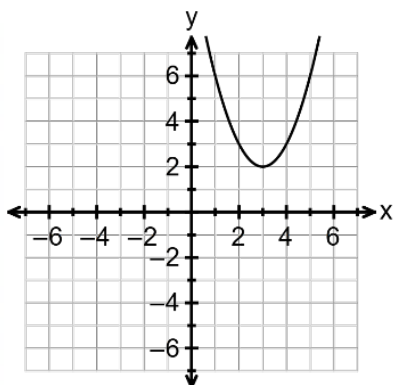
$$j(x) = \log_2(x - 2)$$

$$k(x) = \frac{3}{x + 4} - 2$$

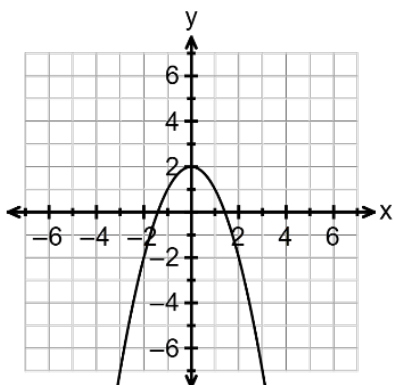
- Determine $2f(3) - g(4)$
 - $g(f(2))$
 - m if $g(m) = f(m)$
 - Give the range of h
 - Give the domain of j
 - Which of the functions has an axis / axes of symmetry?
 - Which of the functions does not have an inverse which is a function?
2. Consider the functions $y = x^2 + 6x + 11$ and $y = -2x^2 + 5x + 3$.
Determine the turning point of each by first writing in the form $y = a(x - p)^2 + q$.
3. The function $f(x) = x^2 + 5x - 2$ is shifted 3 units right and 2 units up. The resulting function is then reflected in the x -axis. What is the equation (in standard form) of the final result?
4. Find the equations of the axes of symmetry of $y = \frac{-7}{x + 3} - 8$
5. Determine the inverse of the following functions giving your answer in the form $f^{-1}(x) = \dots$
- $f(x) = -2x + 3$
 - $f(x) = \log_2(x - 3) + 5$
 - $f(x) = x^2 + 4$. You should restrict the domain of f so that f^{-1} is a function and you should give the corresponding inverse.
 - $f(x) = 2^x + 3$

6. In each of the following graphs the function $y = f(x)$ has been drawn. Draw the required transformation on the same set of axes:

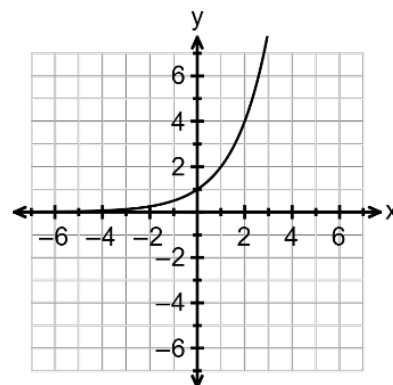
$$y = f(x+7) - 4$$



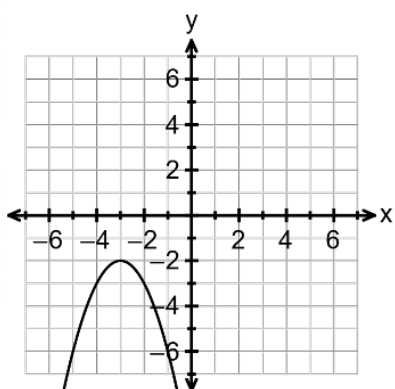
$$y = -f(x)$$



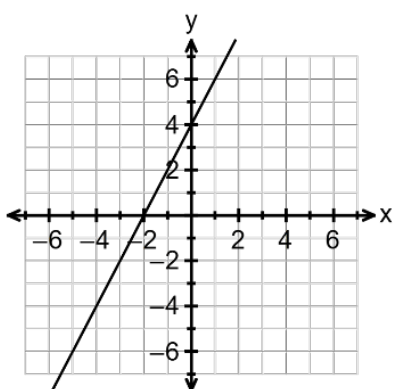
$$y = f^{-1}(x)$$



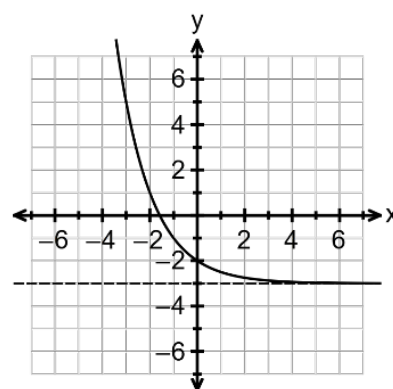
$$y = f(x-5) + 6$$



$$y = f^{-1}(x)$$



$$y = f(-x)$$



7. Sketch the following functions showing all points of interest:

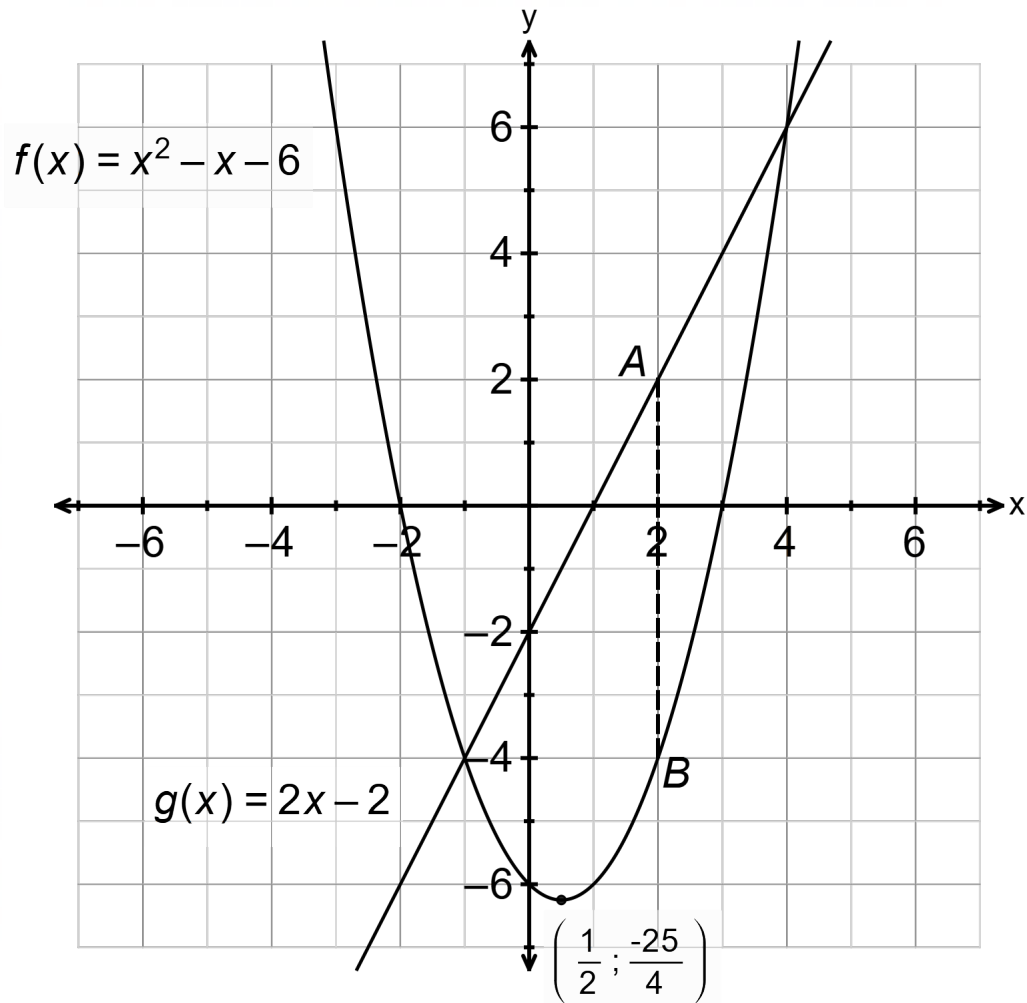
a. $f(x) = \log(x+3)$

b. $g(x) = -2 \times \left(\frac{1}{2}\right)^x + 4$

c. $y = -x^2 + 2x + 8$

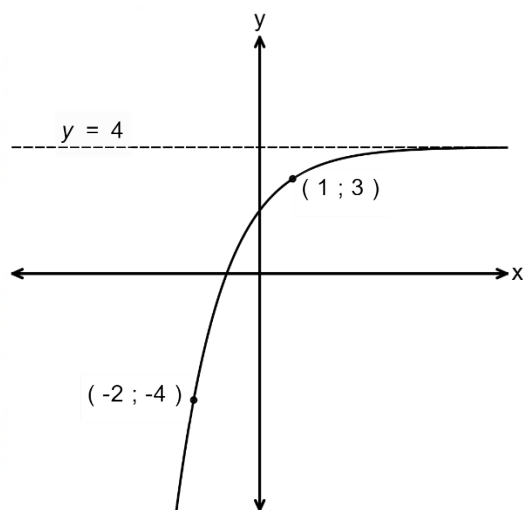
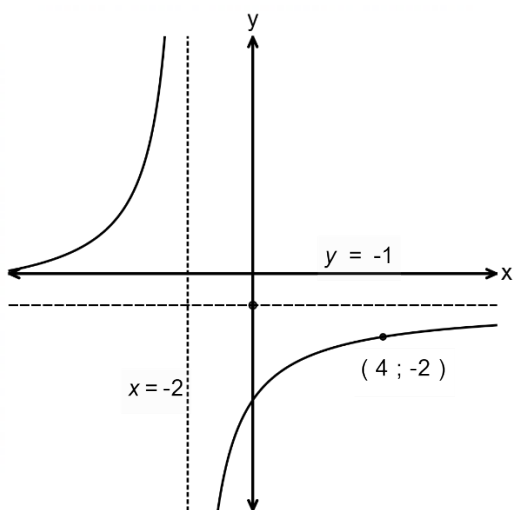
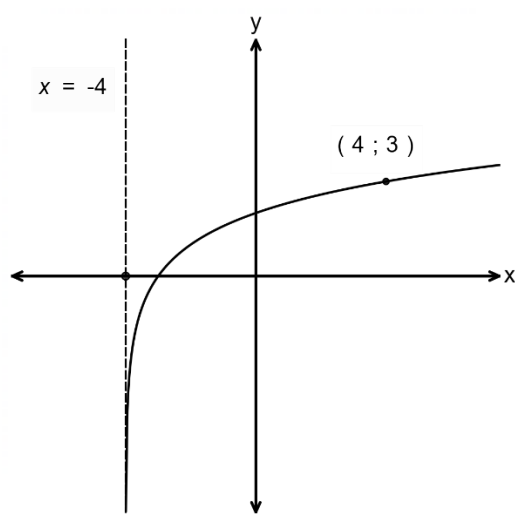
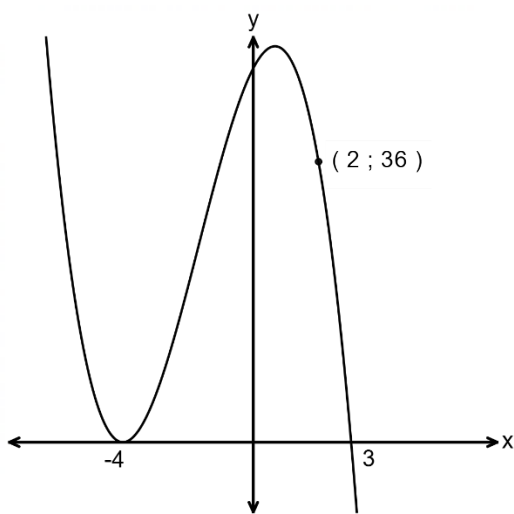
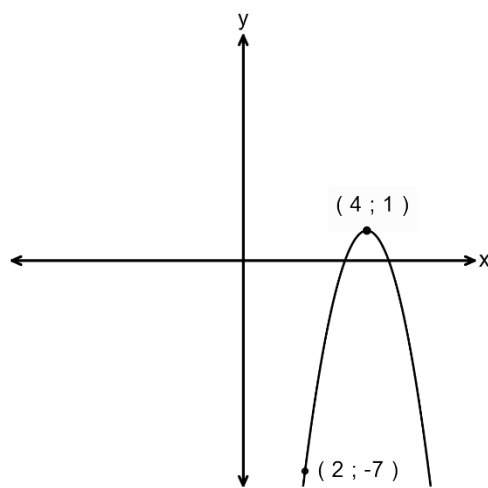
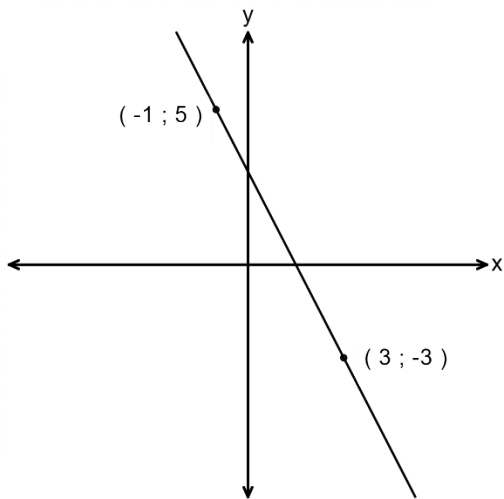
d. $y = -\frac{8}{x+2} - 4$

8. Consider the sketch below and use it to answer the questions which follow:



- For what value(s) of t will $f(x) = t$ have no real roots?
- For what value(s) of k will $f(x + k) = g(x + k)$ have roots of the same sign?
- For what value(s) of x is $f(x) > 0$?
- For what value(s) of x is $f(x) > g(x)$?
- For which value(s) of x is $f(x)g(x) \leq 0$?
- A vertical line AB with A on g and B on f is drawn on the interval where $g(x) > f(x)$. Determine the maximum possible length of AB .

9. Find the equations of the following functions:



10. A function g is such that g^{-1} has domain $-2 < x \leq 9$ and range $y \in (-3; 8]$. Determine the domain and range of g .