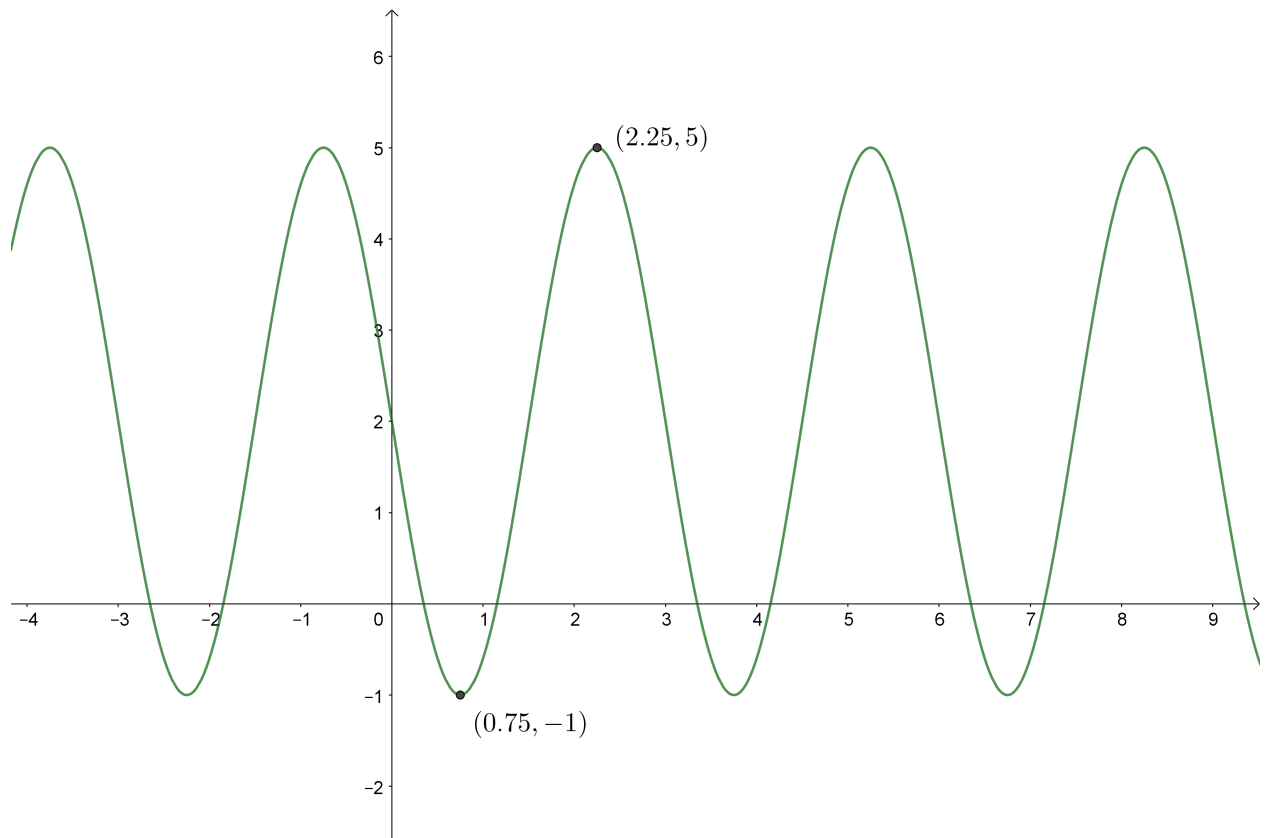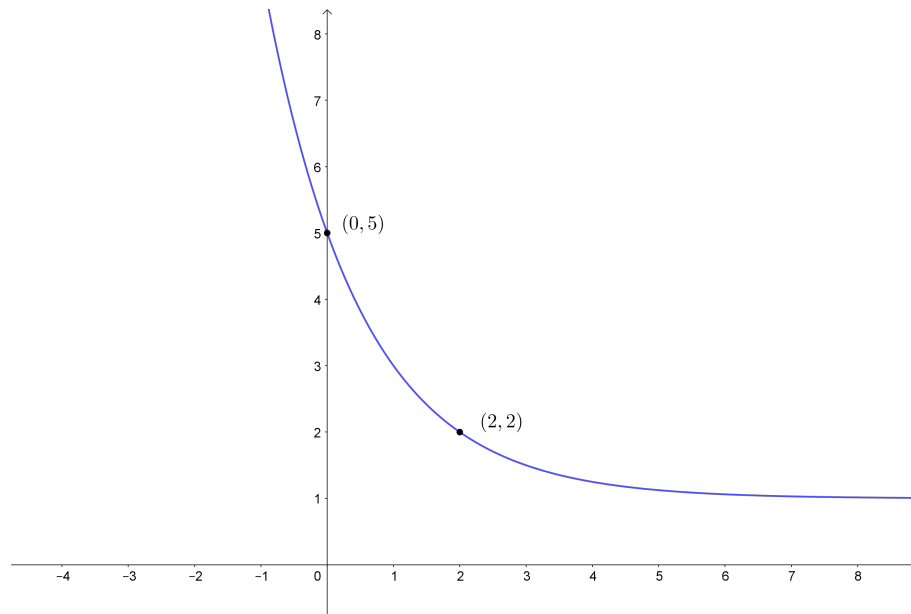Name:

1. (4 points) The following diagram shows the graph of a function
$f(x) = a\sin(bx) + c$, where $a, b, c, \in \mathbb{R}$.

$(2.25, 5)$

$(0.75, -1)$

Find the values of a, b and c.

2. (4 points) The following diagram shows the graph of the function
$f(x) = A \times 2^{-x} + B$, where $A, B \in \mathbb{R}$.

(a) Find the values of A and B.

(b) Write down the equation of the horizontal asymptote of the graph of
$y = f(x)$.

(c) Solve the inequality
$$f(x) > \frac{17}{16}$$

3. (4 points) Polynomial $P(x) = 4x^3 + 5x^2 + ax + b$ is divisible by $(x + 2)$, and when divided by $(x - 1)$ there is a remainder of 6. Find the values of a and b.

4. (4 points) Let $p = \log_a x$ and $q = \log_a y$. Show that:

(a) $\log_{xy} a = \dfrac{1}{p+q}$

(b) $\log_{\frac{x}{y}} a = \dfrac{1}{p-q}$

5. (4 points) Solve the simultaneous equations:

$$\begin{cases} \log_3 x + 4\log_9 y = 2 \\ 2\log_4 x + \log_2 y = 1 \end{cases}$$