IBDP Mathematics
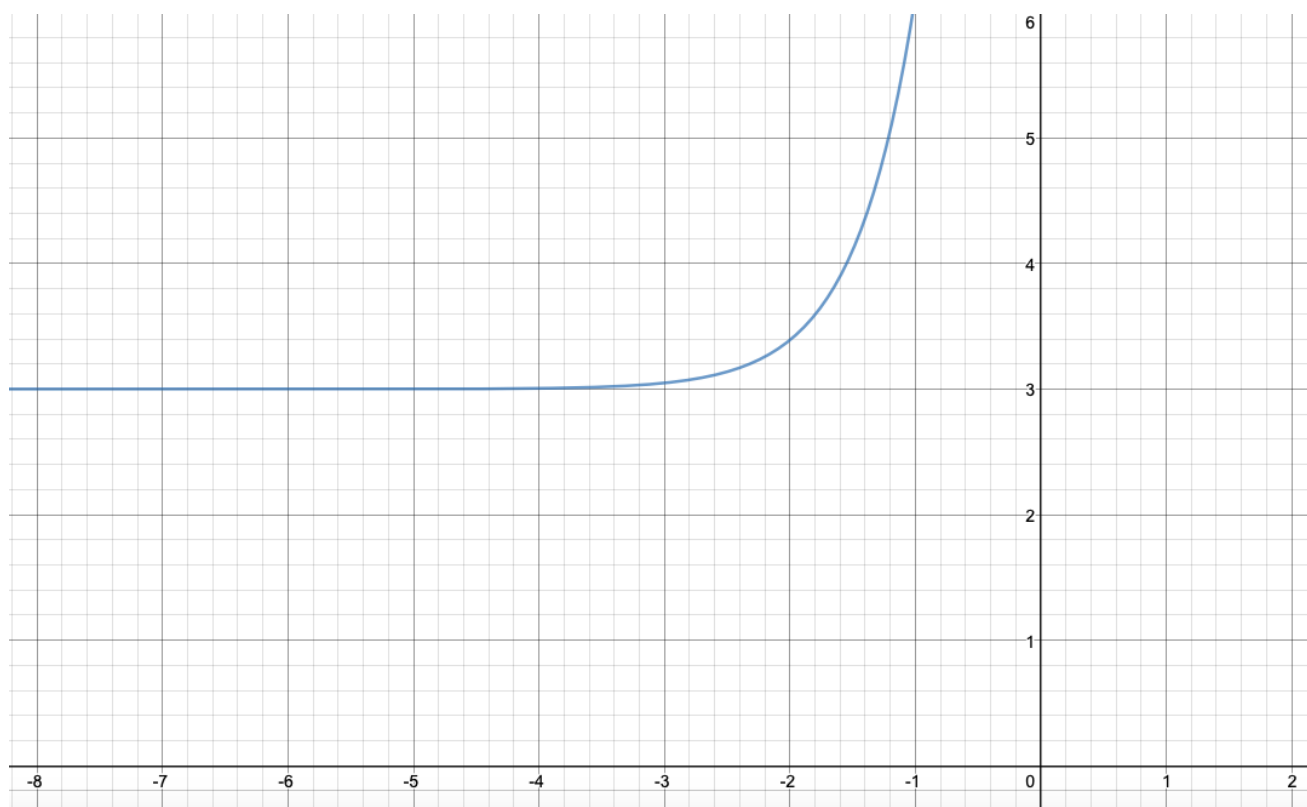Applications and interpretation (SL)
Exponential growth and decay

Exponential growth and decay functions

$$y = ka^x + c$$

Horizontal asymptote is $y = c$.
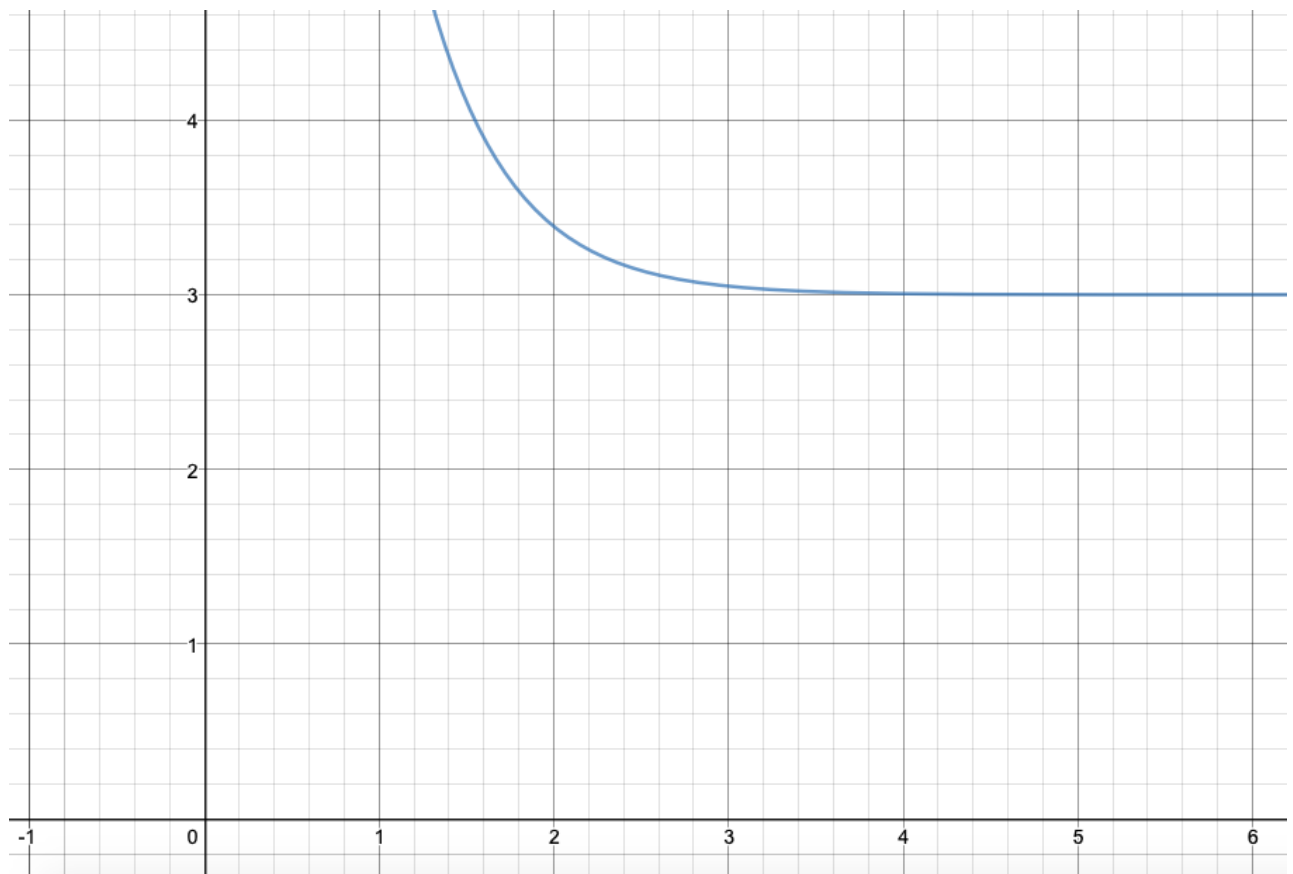
The following shows part of the curve $y = 25 \times 8^x + 3$.

HA is y = 3.

1

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$$y = ke^{-x} + c$$

Reflect in the y-axis.

Horizontal asymptote is $y = c$.

The following shows part of the curve $y = 25 \times 8^{-x} + 3$.

HA is y = 3.

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1. Using GDC, sketch the graph of $y = 3^x - 2$, label the y–intercept and write down the equation of horizontal asymptote.

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Exercise

1. In an experiment, a number of fruit flies are placed in a container. The population of fruit flies, P, increases and can be modelled by the function

$$P(t) = 12 \times 3^{0.498t}, t \geq 0$$

where t is the number of days since the fruit flies were placed in the container.

(a) Find the number of fruit flies

(i) which were placed in the container;

(ii) that are in the container after 6 days.
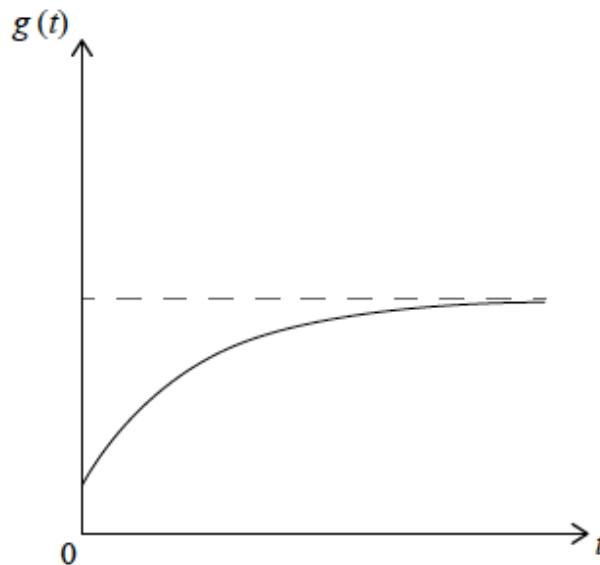
The maximum capacity of the container is 8000 fruit flies.

(b) Find the number of days until the container reaches its maximum capacity.

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2. The amount of yeast, g grams, in a sugar solution can be modelled by the function,

$$g(t) = 10 - k(c^{-t}), t \geq 0$$

where t is the time in minutes.

The graph of $g\ (t)$ is shown.

The initial amount of yeast in this solution is 2 grams.

(a) Find the value of k.

The amount of yeast in this solution after 3 minutes is 9 grams.

(b) Find the value of c.

(c) Write down the maximum amount of yeast in this solution.

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