Investigation on transformation of functions

Part I (Translation)

Objective: In this investigation we will examine the horizontal and vertical translation in graphs of various functions

Use of Graphing calculator is required for this activity (Casio cg20 or Casio cg50 is recommended)

1. Sketch the following curves using your GDC and answer the questions that follow.
   a. $y_1 = 2^x$
   b. $y_2 = 3^x$
   c. $y_3 = 4^x$
   d. $y_4 = (0.5)^x$
   e. $y_5 = (0.25)^x$

   Write down the y intercept and equation of horizontal asymptote of each function

   a) _____

   b) _____

   c) _____

   d) _____

   e) _____

   What do you observe by changing the value of b in $y = b^x$ where $b > 0$ in each equation?

   _____

2. Sketch the following curves using your GDC and answer the questions that follow.
   a. $y_1 = 2^x$
   b. $y_2 = 2^x + 3$
   c. $y_3 = 2^x + 5$
   d. $y_4 = 2^x - 3$

   Write down the y intercept and equation of horizontal asymptote of each function

   a) _____

   b) _____

c) _____

d) _____

What do you observe in the **position** and **shape** by changing the value of k in $y = 2^x + k$ where k is a constant in each equation?

_____

What is the horizontal asymptote of $y = 2^x + k$?

_____

3. Sketch the following curves using your GDC and answer the questions that follow.
   a. $y_1 = 2^x + 3$
   b. $y_2 = 2^{x-2} + 3$
   c. $y_3 = 2^{x-4} + 3$
   d. $y_4 = 2^{x+4} + 3$
   e. $y_5 = 2^{x+2} + 3$

Write down the y intercept and equation of horizontal asymptote of each function

a) _____

b) _____

c) _____

d) _____

e) _____

What do you observe in the **position** and **shape** by changing the value of h in $y = 2^{x-h} + k$ where h is a constant in each equation?

_____

What is the horizontal asymptote of $y = 2^{x-h} + k$?

4. Sketch the following curves using your GDC and answer the questions that follow.
   a. $y_1 = 2^{-x} + 3$
   b. $y_2 = 2^x + 3$

What do you observe in the **position** and **shape** by changing the sign of x in $y = 2^x + k$ in each equation?

5. Sketch the following curves using your GDC and answer the questions that follow.
   a. $y_1 = 2^x$
   b. $y_2 = 2 \times 2^x$
   c. $y_3 = 4 \times 2^x$
   d. $y_4 = 6 \times 2^x$

What do you observe in the **steepness of graph** by changing the value of a in $y = a.2^x$ where a is a constant in each equation?

Summarize the effect of each change in a, b, c and d in $y = a \times b^{x-c} + d$