Exponential Functions

1. For each of the following, state:
   i. the equation of the horizontal asymptote.
   ii. whether the function is increasing or decreasing
   iii. the y-intercept.

a) $y = 3^x - 5$ b) $y = 2^x + 4$ c) $y = 4\left(\frac{1}{3}\right)^x$ d) $f(x) = \left(\frac{1}{2}\right)^x + 2$

e) $g(x) = 2(5^{-x}) + 2$ f) $h(x) = -5\left(\frac{2}{3}\right)^x + 1$

2. For the each of the following curves,
   a) determine the equation of the horizontal asymptote.
   b) state the y-intercept.
   c) state whether the curve is increasing or decreasing.
   d) state the domain and the range.
   e) describe the transformations in words, using the appropriate language.
   f) state the transformation mapping notation.
   g) graph the function neatly on a piece of graph paper.

i) $f(x) = 3(4^x) + 5$ ii) $f(x) = 2\left(\frac{2}{3}\right)^x - 4$ iii) $f(x) = -0.5 \times 2^{x+4} - 1$ iv) $f(x) = \left(\frac{1}{2}\right)^{2x-2} + 1$

ANSWERS:

1.a) $y = -5$, increasing, $(0,-4)$ b) $y = 4$, increasing, $(0,5)$ c) $y = 0$, decreasing, $(0,4)$
d) $y = 2$, decreasing, $(0,3)$ e) $y = 2$, decreasing, $(0,4)$ f) $y = 1$, increasing, $(0,-4)$

Question	2.i	2.ii	2.iii	2.iv
H.A.	$y = 5$	$y = -4$	$y = -1$	$y = 1$
y-int	$(0,8)$	$(0,-2)$	$(0,-9)$	$(0,5)$
Inc/Dec	increasing	decreasing	decreasing	decreasing
Domain	$\{x \in R\}$	$\{x \in R\}$	$\{x \in R\}$	$\{x \in R\}$
Range	$\{y \in R \mid y > 5\}$	$\{y \in R \mid y > -4\}$	$\{y \in R \mid y < -1\}$	$\{y \in R \mid y > 1\}$
Transformations In Words	vertical stretch by a factor of 3, vertical translation up 5 units	vertical stretch by a factor of 2, vertical translation down 4 units	reflection over the x-axis, vertical compression by a factor of 0.5, horizontal translation left 4 units, vertical translation down 1 unit	horizontal compression by a factor of ½, horizontal translation right 1 unit, vertical translation up 1 unit
Transformation Mapping Notation	$T:(x,y) \rightarrow (x, 3y+5)$	$T:(x,y) \rightarrow (x, 2y-4)$	$T:(x,y) \rightarrow (x-4, -0.5y-1)$	$T:(x,y) \rightarrow (0.5x+1, y+1)$