2. [7 points]

a. [3 points] Let $f(x) = \ln(x)$ and let g be the function whose graph is obtained by performing the following transformations to the graph of f, in the following order:

1) A horizontal stretch by a factor of 3.
2) A horizontal shift to the left by 1.
3) A vertical compression by factor of $\frac{1}{5}$.

Write down a formula for $g(x)$

Solution: $g(x) = \frac{1}{5}\ln\left(\frac{1}{3}x(x+1)\right)$

b. [4 points] The graph $y = K(x)$ has the line $y = 2$ as its horizontal asymptote and a horizontal intercept at $(1, 0)$. Let H be the function given by the formula $H(x) = -\frac{1}{7}K(2x+3)$. Find the the horizontal intercept and the equation of the horizontal asymptote of the graph $y = H(x)$.

Solution: Horizontal asymptote: $y = -\frac{2}{7}$.

Horizontal intercept: $(-1, 0)$

3. [6 points]

a. [4 points] Let a be a non-zero number. Find the zeroes of the polynomial $3x(x^2 + ax)^2$ and indicate if each zero is a double zero or a triple zero.

Solution: $p(x) = 3x^3(x + a)^2$. Zeros : $x = 0$ (triple zero) and $x = -a$ (double zero).

b. [2 points] Let f and g be functions given by the formulas

$$f(x) = \sqrt{1 + 7\sqrt{x}} \quad \text{and} \quad h(x) = \sqrt{x}.$$

If g is a function such that $f(x) = g(h(x))$, find a formula for $g(x)$.

Solution: Since $f(x) = \sqrt{1 + 7\sqrt{x}} = \sqrt{1 + 7h(x)}$, then $g(x) = \sqrt{1 + 7x}$.