Unit 1 Test - Charactertistics of Functions

Part A: Knowledge and Understanding (17 marks)

1) *State the domain and range of each relation.* (5 *marks*)

a) $y = -(x-2)^2 + 4$ *b*) $y = \frac{3}{x+3}$ *c*) $y = 3\sin x - 2$

d) $y = \sqrt{x-5} + 4$ *e*) $x = y^2$

2) $(4,-5)$ *is a point on the graph of* $y = f(x)$. *Find the corresponding point on the graph of the function below.* (2 *marks*)

$$f(x) = -3f(\tfrac{1}{4}x - 2) + 7$$

3) *State the domain and range of the function,* $f(x) = -3^{(x+5)} + 2$ (2 *marks*)

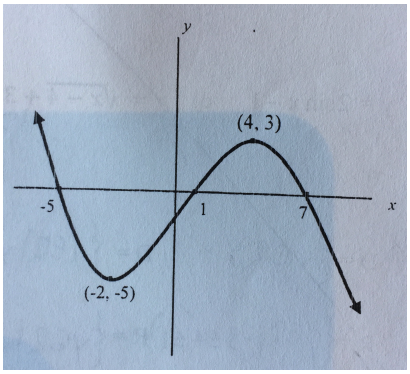
4) *The point* $(6,-8)$ *is on the graph* $y = \frac{-1}{3}g(4x-8) + 1$. *Determine the corresponding point on the parent graph* $g(x)$. (3 *marks*)

5) *Graph the following piecewise function below. State whether each function is continuous or discontinuous. If discontinuous, state where it is discontinuous.* (5 *marks*)

$$f(x) = \begin{cases} |x| - 2 & x \le -1 \\ \frac{1}{x} & -1 < x < 1 \\ \sqrt{x+3} - 1 & x \ge 1 \end{cases}$$

Part B: Application (10 marks)

1) *For the function below, state the end behaviour and increasing/decreasing intervals. (use both set and interval notation)* (4 *marks*)

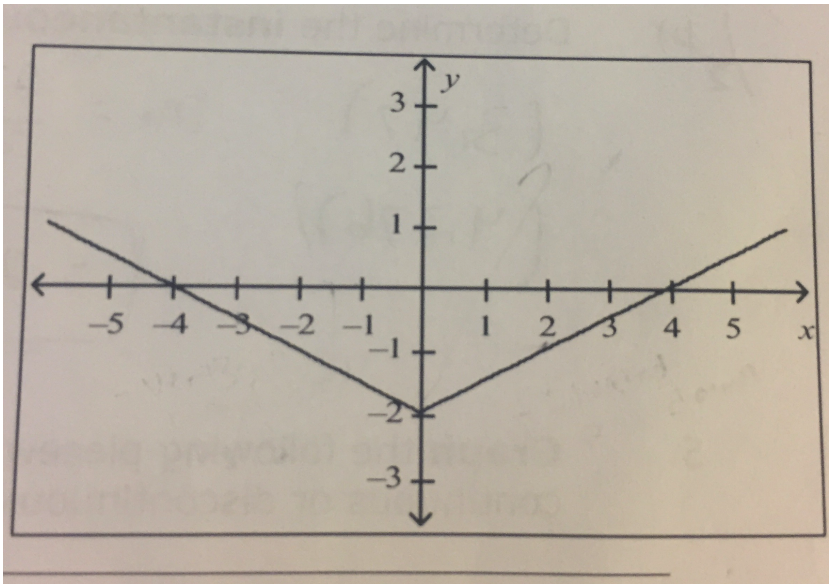


2) *A internet company charges* $25 *for the first* 30 *GB used in a month. After, each GB costs* $1.75

a) Write a piecewise function that represents the charge according to GB usage. (2 *marks*)

b) How many GB did you use if you got charged $63.50 *in one month.* (2 *marks*)

3) *State the equation of the following absolute value function.* (2 *marks*)



Part C: Communication (14 marks)

1) *State the parent function of* $f(x) = 0.5\sqrt{-2x-7}$ *and the transformations applied to get the graph of* $f(x)$. (5 *marks*)

2) *The graph* $y = \sqrt{x}$ *is compressed vertically by a factor of* $\frac{1}{3}$, *horizontally stretched by a factor of* 4, *reflected over the* $x-$ *axis, and translated horizontally left by* 8 *units. Write the equation that results from these transformations.* (2 *marks*)

3*a*) *Name two parent functions that are considered "even"* (2 *marks*)

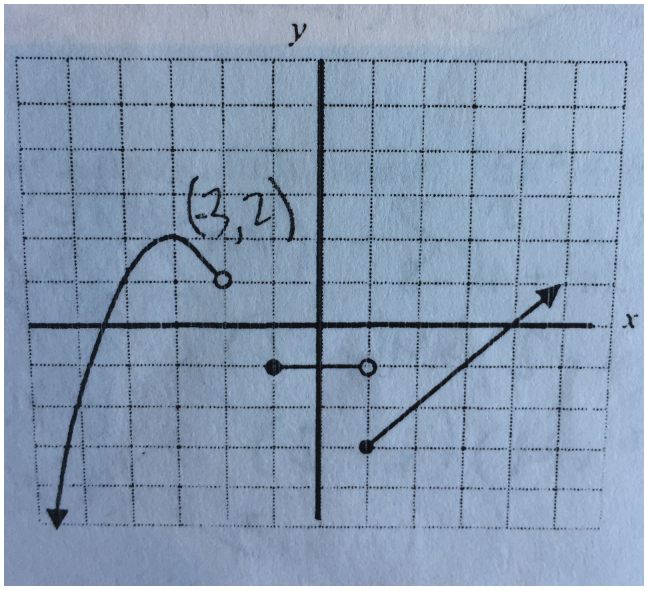
3*b*) *Name a parent function that has an infinite number of zeros* (1 *mark*)

3*c*) *Name two parent functions that have end behaviour such that as* $x \to -\infty$, $y \to 0$ (2 *marks*)

3*d*) *Name two parent functions that are always increasing* (2 *marks*)

Part D: Thinking (12 marks)

1) *Write the algebraic representation of the piecewise function.* (5 *marks*)



2) *For the piecewise function below, determine which value of k makes f(x) continuous.* (2 *marks*)

$$f(x) = \begin{cases} 2x^2 + k & x < 3 \\ 3xk & x \geq 3 \end{cases}$$

3) *Construct a possible graph that has all of the following properties* (5 *marks*)

- $f(4) = -2$ *and* $f(-3) = 1$
- *the function has exactly two zeros, at* $x = 0$ *and* $x = 5$
- *there is a vertical asymptote at* $x = 3$
- *the function decreases on the interval* $x \in (-\infty, 3)$
- *the function increases on the interval* $3 < x < \infty$
- *the function has end behaviour as follows* :
  - *as* $x \to -\infty$, $y \to 4$
  - *as* $x \to \infty$, $y \to 4$