**Calculator Assumed
Function Notation, Function
Transformations, Domain and Range**

Time: 45 minutes
Total Marks: 45
Your Score: / 45

Question One: [1, 1, 2, 2, 2, 2, 3 = 13 marks]

Consider the following functions:

$$f(x) = x - 3 \quad g(x) = -2x^3 + 6 \quad h(x) = \frac{3}{x+2} \quad p(x) = \sqrt{x+1} - 4$$

Calculate:

   (a) $g(-2)$

   (b) $p(8)$

   (c) $h(g(2))$

   (d) $g(m-1)$, giving your answer as an expression in simplified form

   (e)   the value(s) of w for which $f(w) = h(w)$

   (f)   the value(s) of t for which $g(t) > h(t)$

   (g)   the equation of a new function, $q(x)$ where $q(x) = -p(x+4) + 5$

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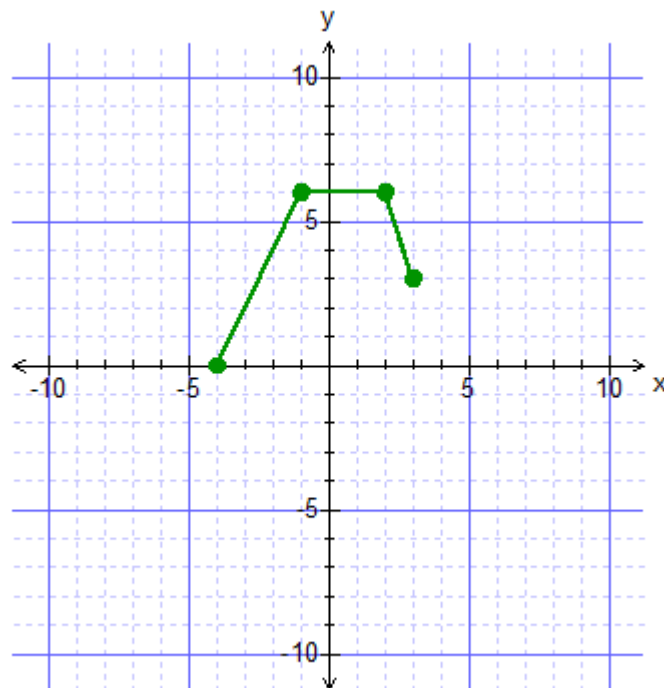
Question Two: [2, 3, 2, 3, 2, 2 =14 marks]

The function $y = f(x)$ is drawn below.
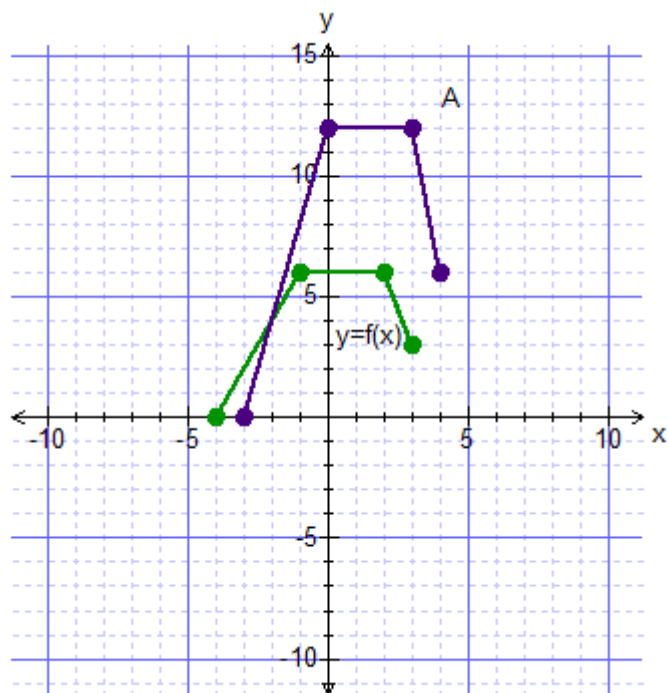
(a)   State the domain and range of the function.

(b) $y = f(x)$ is made up of three line segments.
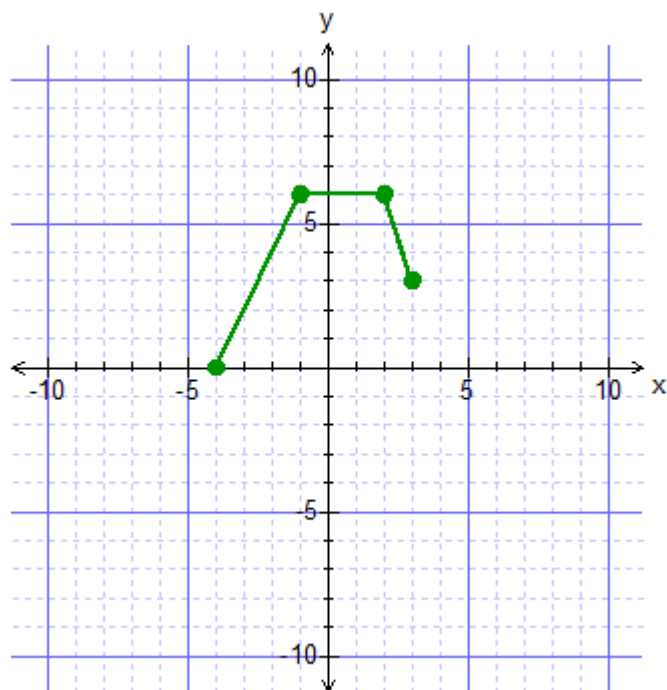Determine the equation of segment A and state its domain.
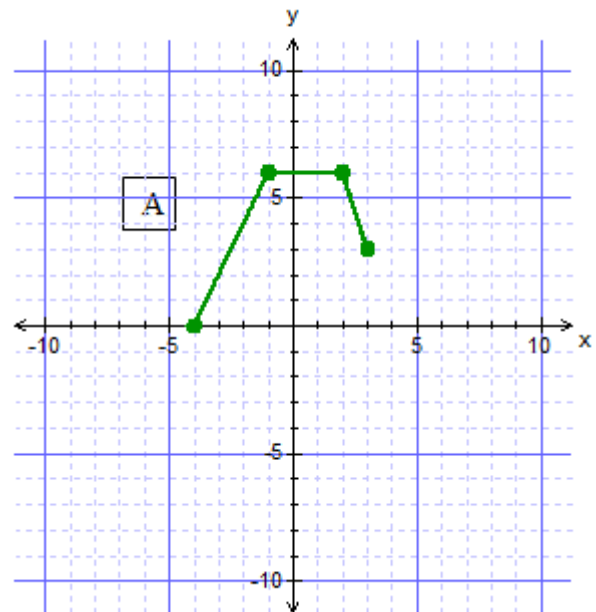
(c)   Determine the root of $y = f(2x+4)$

(d)   Sketch $y = f(-x)$ and $y = -f(x)$ on the axes below, labeling your graphs.

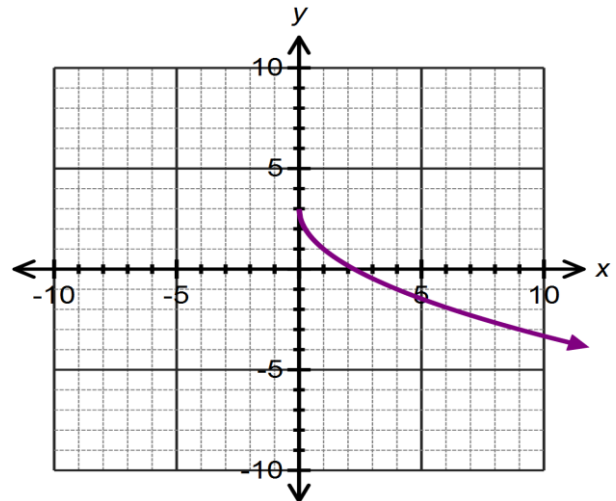(e)   Describe the transformations that graph $y = f(x)$ to graph A, as shown on the axes below.

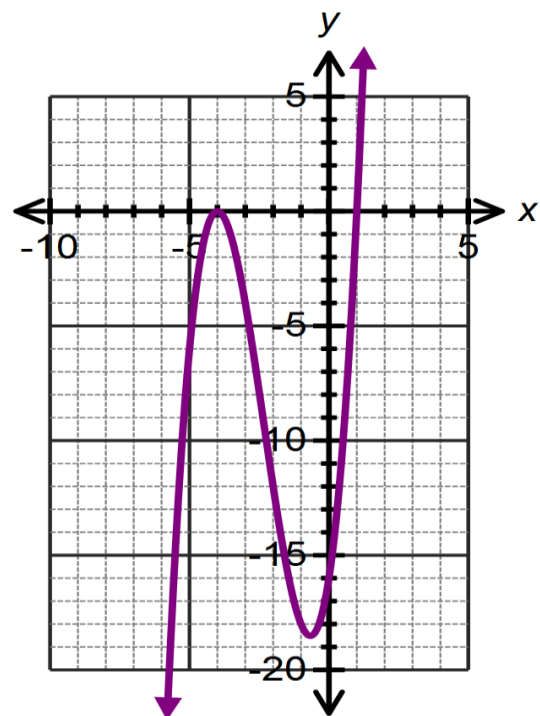(f)   Sketch $y = \dfrac{1}{2} f(x + 3)$ on the axes below.

Question Three: [4, 5, 5, 4 =18 marks]

For each of the following graphs, determine the function equation and state the domain and range of each function graphed.
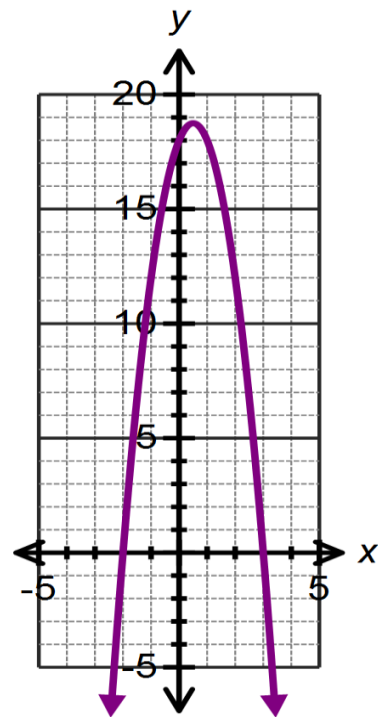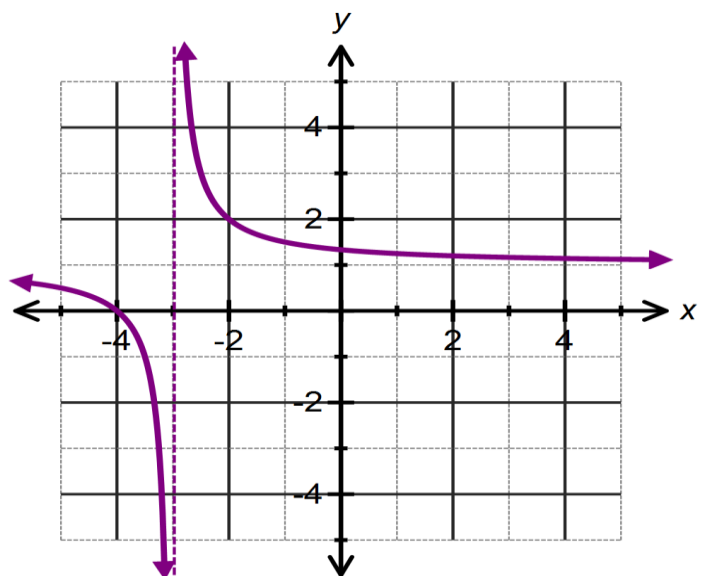
(a)

(b)

(c)

(d)

SOLUTIONS
Calculator Assumed
Function Notation, Function
Transformations, Domain and Range

Time: 45 minutes
Total Marks: 45
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Question One: [1, 1, 2, 2, 2, 2, 3 = 13 marks]

Consider the following functions:

$$f(x) = x - 3 \quad g(x) = -2x^3 + 6 \quad h(x) = \frac{3}{x+2} \quad p(x) = \sqrt{x+1} - 4$$

Calculate:

(a) $g(-2)$ 22   ✔

(b) $p(8)$ -1 ✔

(c) $h(g(2))$ $\dfrac{3}{-10+2} = \dfrac{3}{-8}$ ✔ ✔

(d) $g(m-1)$, giving your answer as an expression in simplified form

$$-2(m-1)^3 + 6 \quad ✔$$
$$= -2m^3 + 6m^2 - 6m + 8 \quad ✔$$

(e)   the value(s) of w for which $f(w) = h(w)$

✔ ✔
$$w = -2.54, \; 3.54$$

(f)   the value(s) of t for which $g(t) > h(t)$

✔ ✔
$$t > -1.84 \qquad t < 1.37$$

(g)   the equation of a new function, $q(x)$ where $q(x) = -p(x+4) + 5$

$$q(x) = -[\sqrt{x+4+1} - 4] + 5 \quad ✔$$
$$= -\sqrt{x+5} + 9$$

✔ ✔

Question Two: [2, 3, 2, 3, 2, 2 =14 marks]

The function $y = f(x)$ is drawn below.
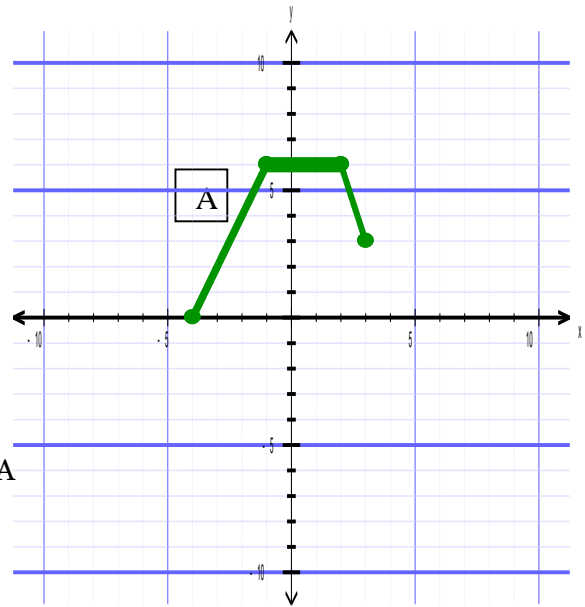
(a)   State the domain and range of the function.

$\{x : x \in \mathbb{R}, -4 \le x \le 3\}$ ✔

$\{y : y \in \mathbb{R}, 0 \le y \le 6\}$ ✔

(b) $y = f(x)$ is made up of three line segments.
Determine the equation of segment A and state its domain.

$y = 2x + 8$ ✔✔

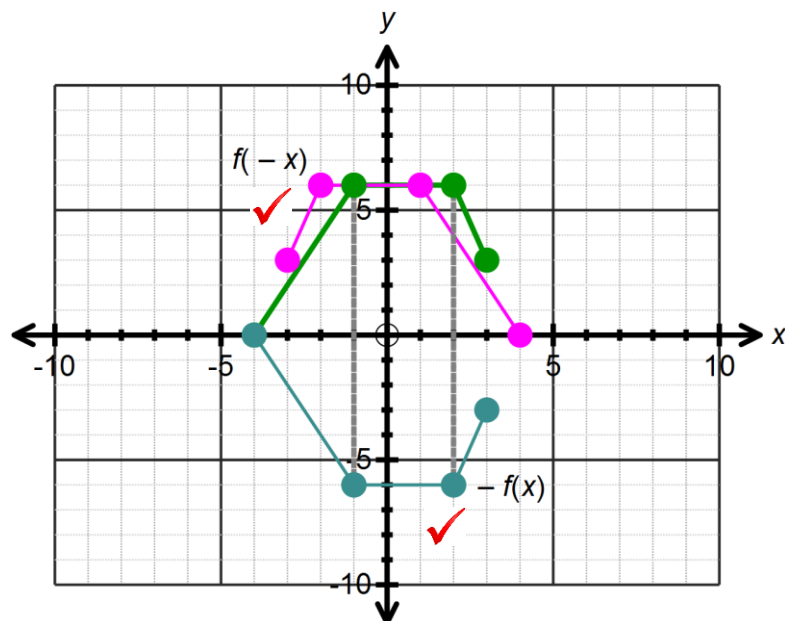$\{x : x \in \mathbb{R}, -4 \le x \le 1\}$ ✔

(c)   Determine the root of $y = f(2x + 4)$

$(-4, 0)$ ✔ ✔

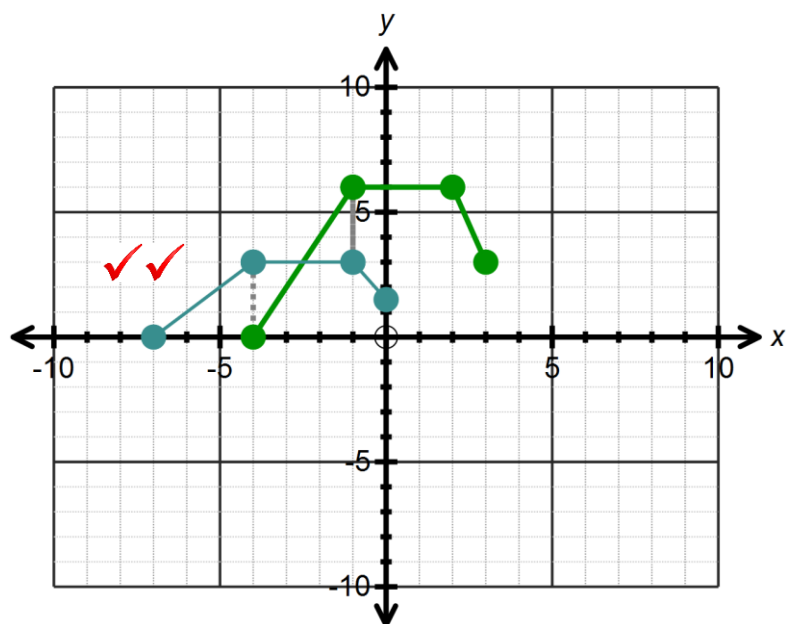(d)   Sketch $y = f(-x)$ and $y = -f(x)$ on the axes below, labeling your graphs.

Labels ✔

(e)   Describe the transformations that graph $y = f(x)$ to graph A, as shown on the axes below.
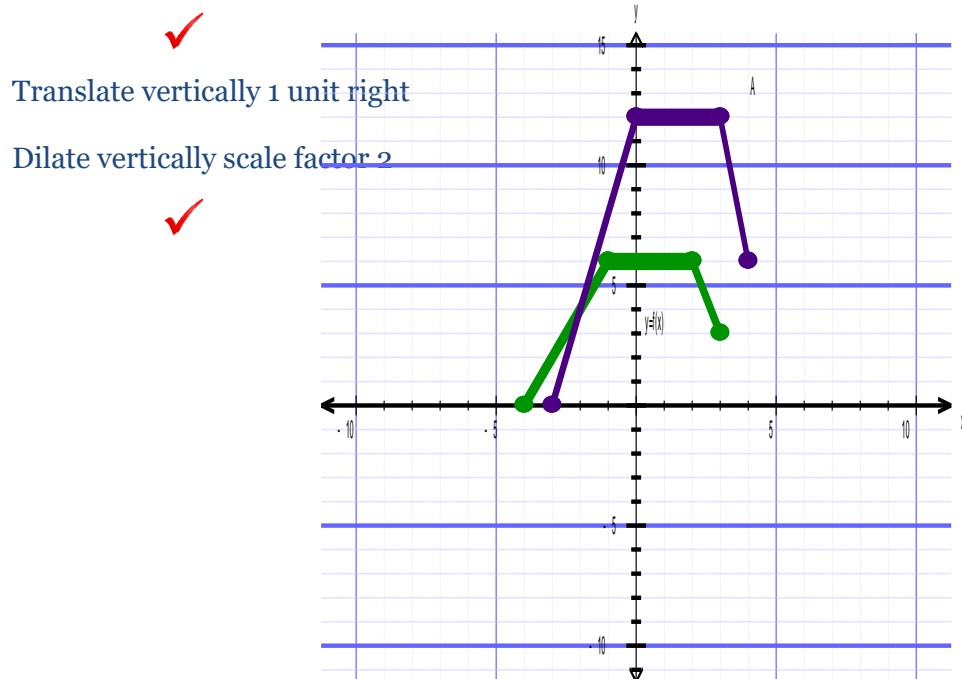
✔

Translate vertically 1 unit right

Dilate vertically scale factor 2

✔

(f)   Sketch $y = \dfrac{1}{2} f(x+3)$ on the axes below.
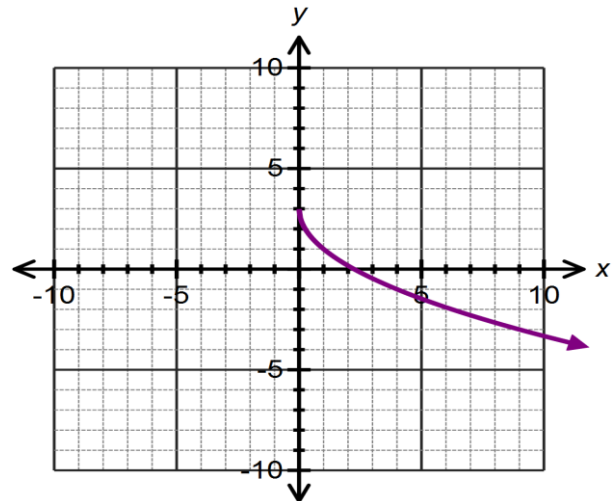
✔✔

Question Three: [4, 5, 5, 4 =18 marks]

For each of the following graphs, determine the function equation and state the domain and range of each function graphed.

(a)

$y = -2\sqrt{x} + 3$
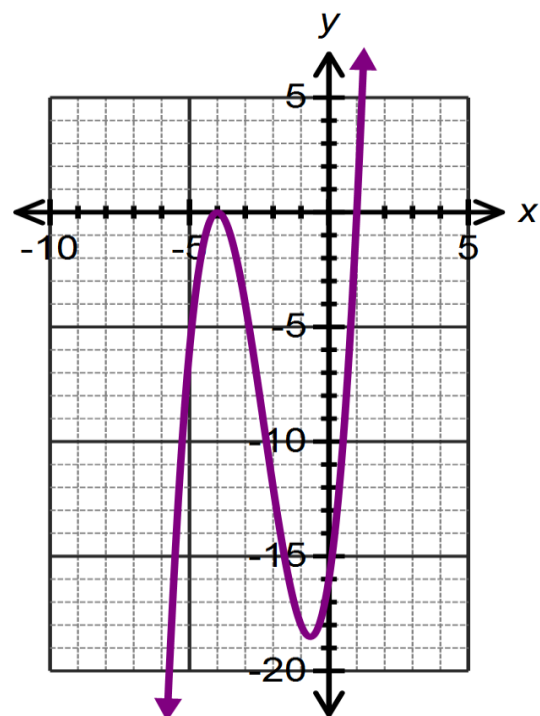$\{x : x \in \mathbb{R}, x \geq 0\}$
$\{y : y \in \mathbb{R}, y \leq 3\}$

(b)

$y = (x+4)^2(x-1)$
$\{x : x \in \mathbb{R}\}$
$\{y : y \in \mathbb{R}\}$

(c)

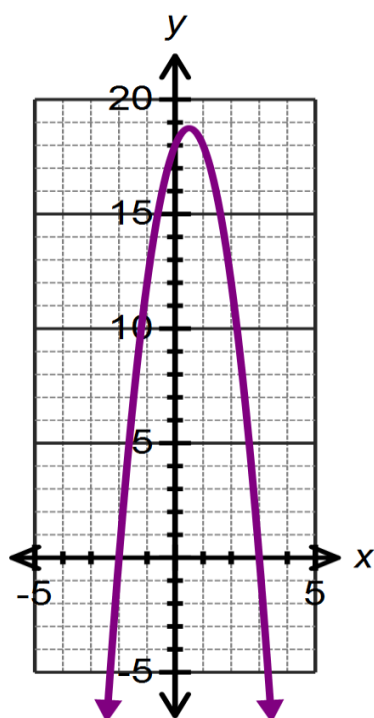$y = -3(x+2)(x-3)$

$\{x : x \in \mathbb{R}\}$

$\{y : y \in \mathbb{R}, y \leq 18.75)$

(d)

$y = \dfrac{1}{x+3} + 1$

$\{x : x \in \mathbb{R}, x \neq -3\}$

$\{y : y \in \mathbb{R}, y \neq 1\}$