Year 10 Term 3 Homework

Student Name: _____	**Grade**: _____
Date: _____	**Score**: _____

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7 Year 10 Term 3 Week 7 Homework

7.1 Functions and Logarithms

7.1.1 Functions

Exercise 7.1.1

1. *If $f(x) = x^2$, find the simplest form of $\frac{f(x)-f(4)}{x-4}$.*

2. *If $g(x) = 3x^3$, find the simplest form of $\frac{g(x)+g(2)}{x+2}$.*

3. *If $h(x) = 2x^2 + 3x + 4$, find the simplest form of $\frac{h(x)-h(3)}{x-3}$.*

Exercise 7.1.2 The function $y = x^2 + 2$ does not have an inverse as it is a many-to-one function. If it is divided into toe parts it is then possible to find the inverse function.

1. *Sketch $y = x^2 + 2$, $x \leq 0$, and use the fact that the inverse function is a reflection in the line $y = x$ to sketch the inverse function.*

2. *Find the equation of the inverse function.*

7.1.2 Inverse Functions $y = f^{-1}(x)$

Exercise 7.1.3 Find the inverse function for each of the following functions:

1. $y = \frac{1}{x-3} - 3$

2. $y = \frac{x-5}{x+5}$

3. $y = \frac{5-2x}{x+5}$

Exercise 7.1.4 Write down a restricted set of permissible x-values, so that each function will have an inverse that is also a function.

1. $y = (x+2)^2$

2. $y = 3x^2 - 2$

3. $y = x(x-4)$

7.1.3 Translating Graphs of functions

To sketch the graph of:

- $y = f(x) + k, (k > 0)$, shift the graph of $y = f(x)$ up k units.
- $y = f(x) - k, (k > 0)$, shift the graph of $y = f(x)$ down k units.
- $y = f(x - h), (h > 0)$, shift the graph of $y = f(x)$ to the right h units.
- $y = f(x + h), (h > 0)$, shift the graph of $y = f(x)$ to the left h units.

Exercise 7.1.5

1. *If $f(x) = x(x - 4)$, sketch the following:*

   (a) $y = f(x) + 2$

   (b) $y = f(x + 2) - 2$

2. *If $f(x) = \frac{1}{2}x - 2$ find $f^{-1}(x)$ and sketch the graph of $y = f^{-1}(x) + 1$.*

3. *If $g(x) = \frac{1}{x+2} + 1$, find the $g^{-1}(x)$ and sketch the graph of $y = g^{-1}(x - 2)$.*

7.1.4 Logarithms

Exercise 7.1.6 Solve the following equations:

1. $(\frac{1}{3})^{x-1} = \frac{\sqrt{12}}{18}$

2. $3^{x-2} = \sqrt[3]{9}$

3. $9^{x+1} = \sqrt{3}$

4. $9 \times 2^x = 6^x$

5. $4^x - 10(2^x) + 16 = 0$

6. $3^{2x} - 4(3^x) + 3 = 0$

7.1.5 Definition of a logarithm

The logarithm of a number to any base is the index to which the base must be raised to give that number.

$$y = a^x \Rightarrow log_a\, y = x \qquad \text{where } a > 1 \text{ and } y > 0$$

Exercise 7.1.7 Write each of the following expressions in logarithmic form

1. $46 = 4^3$ _____
2. $3^{-2} = \frac{1}{9}$ _____
3. $\sqrt[3]{5} = 5^{\frac{1}{3}}$ _____
4. $49^{-\frac{1}{2}} = \frac{1}{7}$ _____
5. $16^{-\frac{3}{4}} = \frac{1}{8}$ _____

Exercise 7.1.8 Write each of the following expressions in index form:

1. $log_6\, 36 = 2$ _____
2. $log_2\, 32 = 5$ _____
3. $log_8\, 4 = \frac{2}{3}$ _____
4. $log_{27}\, 3 = \frac{1}{3}$ _____
5. $log_7\, \sqrt{7} = \frac{1}{2}$ _____

Exercise 7.1.9 Evaluate the following:

1. $log_2\, \sqrt{2}$ = _____
2. $log_4\, 16$ = _____
3. $log_8\, 4$ = _____
4. $log_3\, (\frac{1}{9})$ = _____
5. $log_6\, (\frac{1}{\sqrt{6}})$ = _____
6. $log_2\, 0.25$ = _____
7. $log_4\, \sqrt{2}$ = _____
8. $log_4\, (\frac{1}{4})$ = _____

Exercise 7.1.10 Solve for x.

1. $log_{16} x = \frac{3}{4}$

2. $log_{25} x = -\frac{1}{2}$

3. $log_{32} x = -\frac{3}{5}$

4. $log_x 121 = 2$

5. $log_x 27 = \frac{3}{2}$

6. $log_x (\frac{1}{16}) = -4$

7. $log_3[log_3(log_3 x)] = 0$

7.1.6 The logarithm laws

- $log_a\, x\, y = log_a\, x + log_a\, y$
- $log_a\, (\frac{x}{y}) = log_a\, x - log_a\, y$
- $log_a\, x^n = n\, log_a\, x$
- $log_a\, 1 = 0; \quad log_a\, a = 1; \quad log_a\, a^x = x$

Exercise 7.1.11 Evaluate each of the following using the logarithm laws:

1. $log_4\, 36 - 2\, log_4\, 3$

2. $4\, log_8\, 2 + \frac{1}{2}\, log_8\, 16$

3. $2\, log_{10}\, 5 - log_{10}\, (\frac{1}{4})$

4. $log_4\, 14 + log_4\, 32 - log_4\, 7$

5. $2\, log_5\, 10 - 3\, log_5\, 2 + \frac{1}{2}\, log_5\, 100$

Exercise 7.1.12 If $log_a 2 = 0.631$ **and** $log_a 5 = 1.465$**, find the value of the following:**

1. $log_a 125$

2. $log_a (\frac{1}{2})$

3. $log_a \sqrt{20}$

4. $log_a 0.25$

Exercise 7.1.13 If $log_a 3 = 0.477$**,** $log_a 4 = 0.602$ **and** $log_a 6 = 0.778$**, find the value of the following:**

1. $log_a 0.75$

2. $log_a (\frac{1}{\sqrt{3}})$

3. $log_a 4.5$

4. $log_a \sqrt{48}$

Exercise 7.1.14 Solve the following equations.

1. $log\, x + log\, 4 = log\,(x + 21)$

2. $log(x - 6) - log\, 2 = log\,(x + 2) - log\, 3$

3. $log\, 2 + log\,(x + 4) = 2\, log\, x$

4. $log\, 12 - log\,(x - 1) = log\, x - log\,(x - 3)$

5. $log_5\,(3x + 13) = log_5\,(x - 1) + 1$

6. $log_3\, x + log_3\,(x + 8) = log_3\, 9$