Dawson College: **Functions and Trigonometry**: 201-009-50-S02: Winter 2009

Name: _____
Student ID: _____

Test 3

This test is graded out of 47 marks. No books, notes, graphing calculators or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1.

a. *(5 marks)* Sketch the graph of the piece-wise function:

$$f(x) = \begin{cases} (x+1)^2 & \text{if } x < -1 \\ 1 & \text{if } -1 \leq x < 1 \\ \sqrt{x-1} & \text{if } x > 1 \end{cases}$$

b. *(2 marks)* State the domain and range of the above function, $f(x)$.

c. *(1 mark)* Is the above function, $f(x)$, injective, justify.

Question 2.

a. *(4 marks)* Sketch the graph of the following function:

$$f(x) = 2^{x+1} - 2$$

b. *(4 marks)* Sketch the graph of the following function:

$$g(x) = \log_3(x+1) + 2$$

c. *(2 marks)* State the domain and range of the above two functions, $f(x)$ and $g(x)$.

d. *(2 marks)* Are the above two functions, $f(x)$ and $g(x)$, injective, justify.

Question 3.

a. *(1 mark)* Suppose $h(x)$ is injective and $h(2) = 3$, find $h^{-1}(3)$

b. *(4 marks)* Verify that $g(x)$ is the inverse of $f(x)$, where $g(x) = \sqrt[3]{x+1}$ and $f(x) = x^3 - 1$.

c. *(5 marks)* Find $k^{-1}(x)$ for the following function:

$$k(x) = \frac{2x+5}{3x-2}$$

Question 4.

a. *(2 marks)* Express in terms of a simple logarithm:

$$\log \sqrt[4]{xy^2\sqrt{z}}$$

b. *(2 marks)* Express as a single logarithm with coefficient of one:

$$\frac{1}{2}\log x + \frac{3}{2}\log 2y - \log x^2 y$$

c. *(5 marks)* Solve for x.

$$\ln(x-2) + \ln(2x+1) = 2\ln x$$

Question 5. Let $f(x) = \log_2 x$ then

a. *(1 mark)* evaluate $f(0)$.

b. *(1 mark)* evaluate $f(1)$.

c. *(1 mark)* evaluate $f\left(\frac{1}{8}\right)$.

Question 6. Solve for x.

a. *(1 mark)*

$$\log_x 3 = -1$$

b. *(4 marks)*

$$4^{2x-1} = 7^{x+2}$$

Bonus.

a. *(2 marks)* Solve for x:

$$[\log_3(x-1)]^2 - 3\log_3(x-1) = 4$$

b. *(2 marks)* Solve for x:

$$2^x + 2^{-x} = 2$$

c. *(2 marks)* Solve for x:

$$\ln x - \log x = 1$$