Dawson College: **Introduction to Applied Mathematics**: 201-912-DW: Fall 2012

Name: _____
Student ID: _____

Test 1

This test is graded out of 50 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. If you need more space for your answer use the back of the page.

Formulae:

Equation of the least squares line: $y = mx + b$

$$m = \frac{n\sum xy - (\sum x)(\sum y)}{n\sum x^2 - (\sum x)^2}$$

$$b = \frac{(\sum x^2)(\sum y) - (\sum xy)(\sum x)}{n\sum x^2 - (\sum x)^2}$$

Question 1. *(5 marks)* Simplify the following expressing your final answer with positive exponents only:

$$\frac{\left(-\frac{1}{3}x^{-1}y^3\right)^{-2}}{x^2y^{-3}z} \div \left(\frac{x^6z}{3(x^{-1}y^2)^0z^6}\right)^{-1}$$

Question 2. Convert the following and *use the correct number of signigicant figures*

a. *(2 marks)* 12.2 kN·m bending moment to ft·lb.

b. 2.37 miles per minutes to

   i. *(2 marks)* km/hr

   ii. *(2 marks)* ft/sec

Question 3. Let $f(x) = \sqrt{3x-1}$, evaluate and simplify the following:

a. *(1 mark)* $f(\frac{1}{3})$

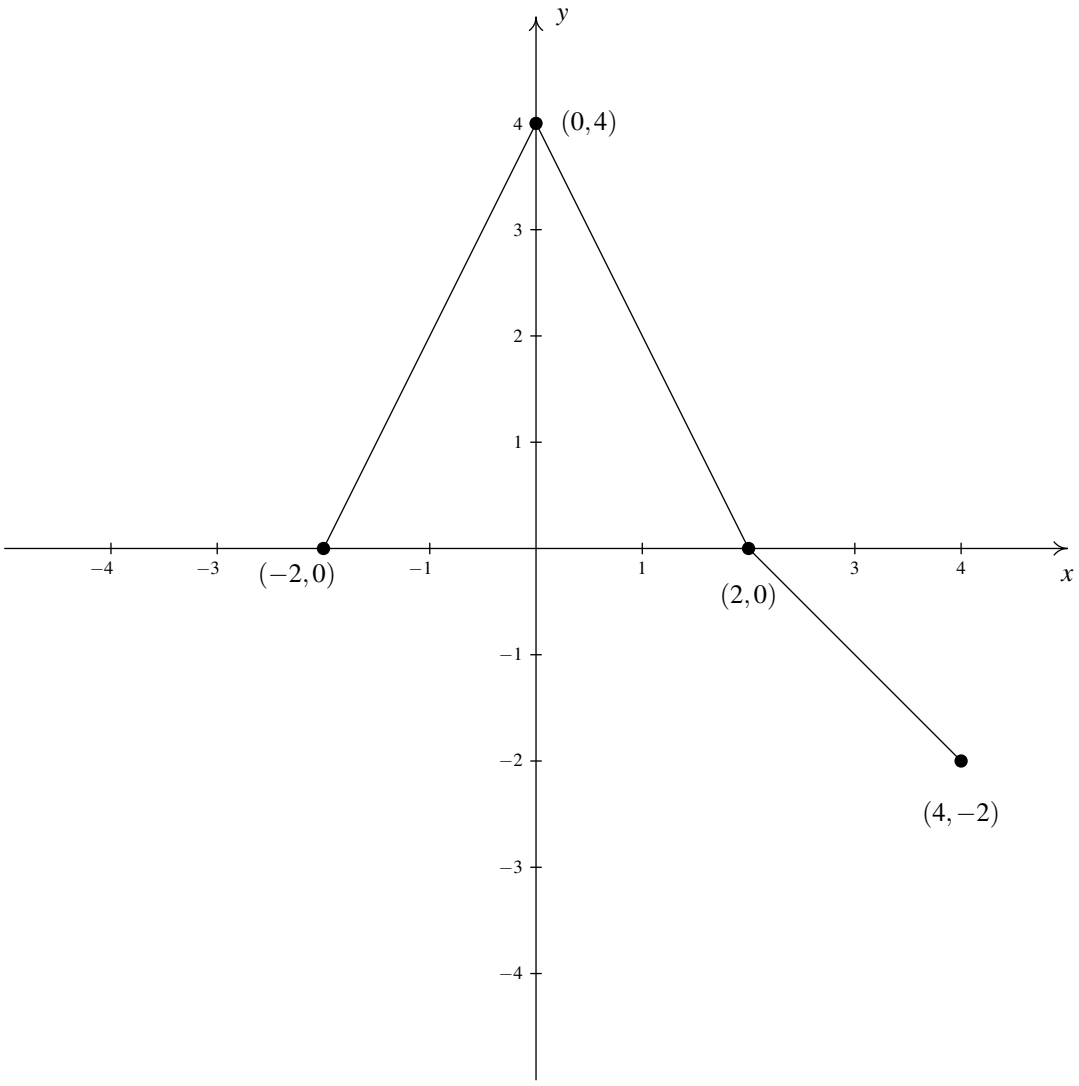
b. *(1 mark)* $3f(x)$

c. *(1 mark)* $f(x+1)$

d. *(1 mark)* $f(a+h)$

e. *(1 mark)* $f(a)+f(h)$

Question 4. *(5 marks)* The complete graph of $y = f(x)$ is given below. Graph $y = \frac{1}{2}f(x+1)-1$ on the given set of axes.



Question 5. Let $f(x) = \sqrt{x+1}$, $g(x) = x^2 - 5$.

a. *(2 marks)* Simplify the expression $(f \circ g)(x)$.

b. *(1 mark)* Evaluate $(f \circ g)(0)$, if possible.

c. *(1 mark)* Evaluate $(f \circ g)(2)$, if possible.

d. *(2 marks)* State the domain of $f \circ g$.

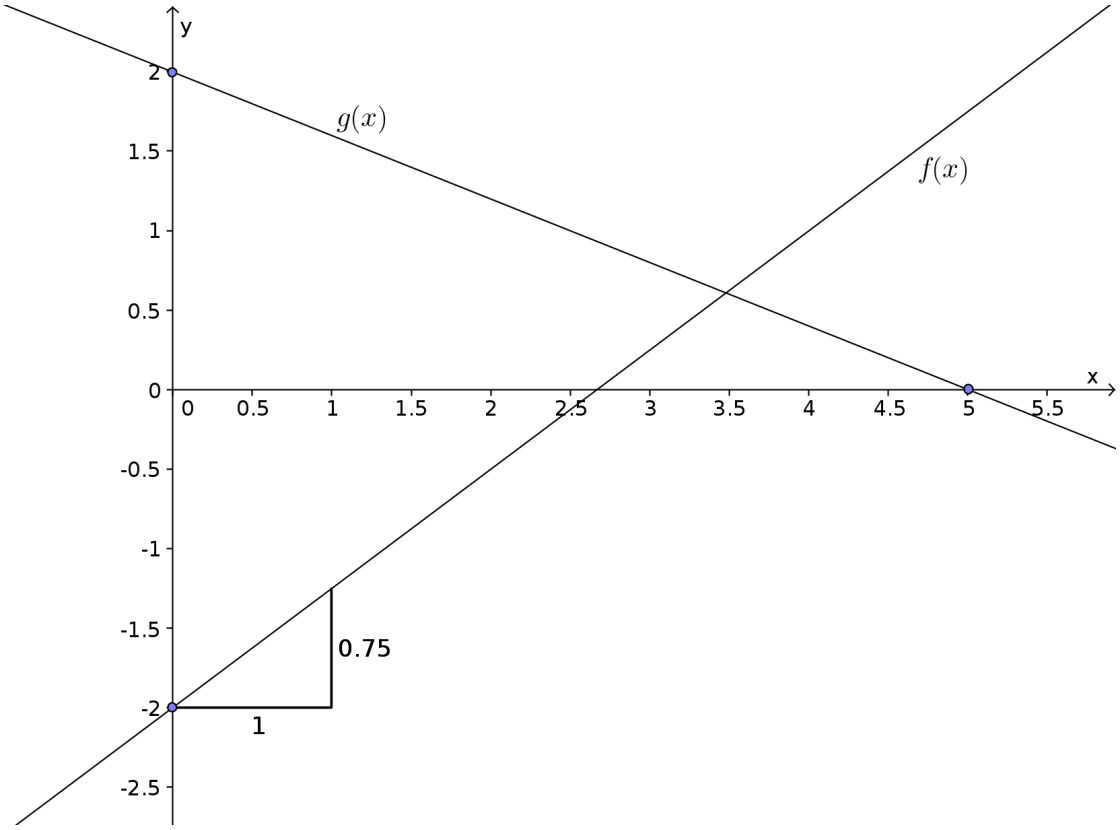
Question 6. *(5 marks)* Given

$$f(x) = \frac{2x-3}{4x+1}.$$

a. *(4 marks)* Find $f^{-1}(x)$.

b. *(1 mark)* State the domain of f and f^{-1}.

Question 7. *(6 marks)* Given the graph of $f(x)$ and $g(x)$. Determine the function $f(x)$ and $g(x)$. *Important: do not assume any unlabeled points on the graph.*



Question 8. *(7 marks)* Sketch the graph of the function $f(x) = -4x^2 + 4x + 3$ by finding and using its vertex, x-intercepts and y-intercept. Also state the domain and range of the function.

Question 9. *(5 marks)* A contractor firm is investigating the relation, if any, between the estimated cost and the real cost of construction projects, based on the following data. Estimate the real cost for a contract whose estimated cost is 20 M$.

Estimated Cost (M$)	2	3	4	6	9	12	14	18
Real Cost (M$)	2	5	6	7	10	11	11	21

Bonus Question. *(3 marks)* (From the 5th Dawson Mathematics Competition)
If $f(x) = ax + b$ and $f^{-1}(x) = bx + a$ where a and b are real number, find a and b.