Name: _____
Student ID: _____

Test 2

This test is graded out of 45 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.

Question 1. *(5 marks)* Integrate the following indefinite integral:

$$\int e^x \cos(2x)\, dx$$

Question 2. *(5 marks)* Integrate the following definite integral:

$$\int_0^1 3ye^{2y}\,dy$$

Question 3. *(5 marks)* Integrate the following indefinite integral:

$$\int \frac{x^4+2x+1}{x+2}\,dx$$

Question 4. *(10 marks)* Sketch the graph of the following functions:

$f(x) = -x^2 + 4x + 5$ and $g(x) = -x - 1$.

Then find the area bounded by the two functions.

Question 5. *(10 marks)* The bookstore “L’Insoumise” has studied the demand and supply equations for their in house published book The Family by Ba Jin. They have determined that the demand equation is given by

$$p = \frac{400}{x+4}$$

and supply equation is given by

$$p = \frac{x+38}{2}.$$

Find the consumers’ surplus and producers’ surplus.

Question 6. *(5 marks)* Integrate the following indefinite integral:

$$\int \frac{x^2+x+1}{(x+1)(x-2)^2}\,dx$$

Question 7. *(5 marks)* The hipster population in Mile End, Montreal is growing at a rate of

$$213\left(1+\frac{2x}{x^2+2}\right)$$

(Clothing stores have reported a shortage of skinny black jeans?!?!?). If the current population of hipsters is 2483 what is the projected population in three years.

Bonus Question. *(3 marks)*
Given the following basic rule of differentiation

$$\frac{d}{dx}\left[\arctan x\right]=\frac{1}{1+x^2},$$

determine the following indefinite integral

$$\int \arctan x\, dx.$$