Dawson College: **Integral Calculus**: 201-SN3-RE-S2: Winter 2026: **Quiz 3** name: _____

Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531**. You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1. *(5 marks)* Evaluate the following integral

$$\int \frac{e^{2x}+e^{x}+e^{x}\sec(\ln(e^{x}+1))}{e^{x}+1}\,dx$$

Question 2. *(5 marks)* If f is continuous on $\mathbb{R}$, prove that

$$\int_{a}^{b} f(-x)\,dx = \int_{-b}^{-a} f(x)\,dx$$

For the case where $f(x) \geq 0$ and $0 < a < b$, draw a diagram to interpret this equation geometrically as an equality of areas.

Question 3. *(5 marks)* Evaluate the following integral

$$\int_{0}^{1/3} \frac{1}{(9x^{2}+1)^{5/2}}\,dx$$

Question 4. *(5 marks)* Evaluate the following integral

$$\int_{-\pi/12}^{\pi/12} \left(\frac{(x^2+1)\sin x}{x^4+1} + \cos^2 2x \right) dx$$

Question 5. *(5 marks)* Evaluate the following integral

$$\int \frac{\ln x}{x^{3/2}}\, dx$$

Question 6.

a. *(2 marks)* Use integration by parts to show that

$$\int f(x)\, dx = xf(x) - \int xf'(x)\, dx$$

b. *(3 marks)* If f and g are inverse functions and $f'(x)$ is continuous, prove that

$$\int_a^b f(x)\, dx = bf(b) - af(a) - \int_{f(a)}^{f(b)} g(y)\, dy$$

(Hint: Use part (a.) and make the substitution $y = f(x)$.)