Dawson College: **Integral Calculus**: 201-SN3-RE-S2: Winter 2026: **Quiz 2** 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.

Formulae: $\sum_{i=1}^{n} c = cn$ where c is a constant $\quad \sum_{i=1}^{n} i = \frac{n(n+1)}{2} \quad \sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} \quad \sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}$

Question 1. *(1 mark each)* Complete each of the following sentences with MUST, MIGHT, or CANNOT.

a. Linear Algebra II _____ be extremely fun.

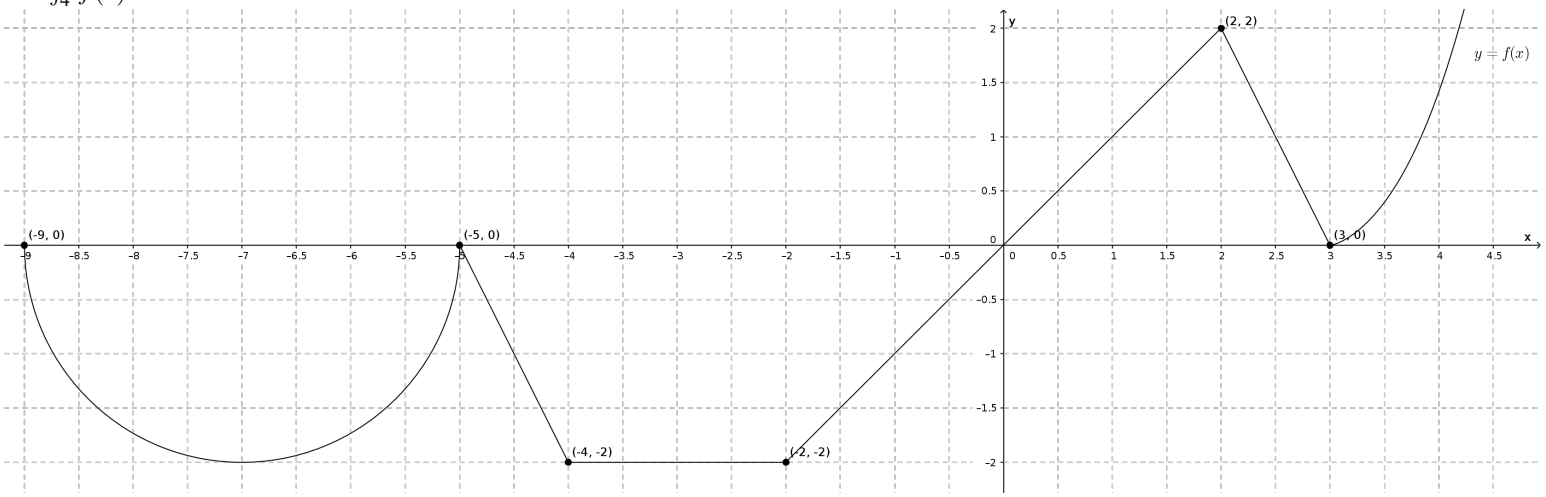
b. Suppose $f(x)$ is integrable then $f(x)$ _____ be continuous.

c. $\int_a^b f(x)\,dx$ _____ be equal to $\lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\Delta x$ where $\Delta x = (b-a)/n$ and $x_i = a + i\Delta x$ if $f(x)$ is integrable.

d. $\int_a^b f(x)\,dx$ _____ be equal to $\int_b^a -f(\alpha)\,d\alpha$ if $f(x)$ is integrable.

Question 2. *(2 marks)* Suppose $f(x)$ is integrable on $[a,\ b]$ and $c \in \mathbb{R}$. Prove $\int_a^b cf(x)\,dx = c\int_a^b f(x)\,dx$.

Question 2. The graph of $y = f(x)$ consists of straight lines, one semicircle and a curve on the interval $[3,\infty)$. In addition, $\int_4^3 9f(x)\,dx + 4 = 0$ and $\int_4^5 f(x)\,dx = 1$.



a. *(3 marks)* Evaluate $\int_3^5 f(x)\,dx$.

b. *(5 marks)* Evaluate $\lim_{n\to\infty} \sum_{i=1}^{n} (i/n + f(x_i))\,\Delta x$ where $x_i = -7 + i\Delta x$ and $\Delta x = 3/n$.

c. *(2 marks)* Sketch the function $g(x) = \int_{-2.5}^{x} f(t)\,dt$ on $[-2.5,\ -1.5]$, on the above graph, and label 3 key points.

Question 3. *(5 marks)* Find the average value of the function $f(x) = \frac{\sin x + \sin x \tan^2 x}{\sec^2 x}$ on $[-\pi/3, \pi/4]$.

Question 4. *(5 marks)* Given the function $f(x) = \int_{\arctan x}^{\pi/4} \frac{\tan(\tan t)}{\tan t}\, dt$. Find $f'(x)$ using the 2nd FTC presented in class and simplify completely. **(Show all your work!)**

Bonus Question. *(2 marks)* Using the definition of the derivative of a function $g'(x) = \lim_{h \to 0} \frac{g(x+h) - g(x)}{h}$ simplify $g'(x)$ into a single term where $g(x) = \int_a^x f(t)\, dt$