Dawson College: **Calculus II** (SCIENCE): 201-NYB-05-S3: Winter 2023: **Quiz 11** 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.

a. *(2 marks)* Show that $0 < \frac{(n!)^2}{(2n)!} < 1$ when $n \geq 1$.

b. *(4 marks)* Use part a. (whether or not you have shown it) to determine if the following sequence converges or diverges. If it converges, find its limit.

$a_n = \dfrac{(n!)^2}{(2n+1)!}$

Question 2. *(3 marks)* Find a formula for the general term a_n of the sequence, assuming that the pattern of the first few terms continues.

$$\left\{\frac{1}{2}, -\frac{4}{3}, \frac{9}{4}, -\frac{16}{5}, \frac{25}{6}, \cdots\right\}$$

Question 3. *(5 marks)* Determine whether the sequence converges or diverges. If it converges, find the limit.

$$a_n = n \int_0^{1/n} \arccos(t)\, dt$$