Dawson College: **Calculus II** (SCIENCE): 201-NYB-05-S4: Winter 2011

Name: ____________________
Student ID: ____________________

Test 3

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)* Set up the integral to find the volume of the solid obtained from the region bounded by the graphs of $y = -(x-4)^2+16$, $y=(x-3)^2-9$ rotated about the line $x=-\pi$.

Question 2. *(5 marks)* Determine whether the sequence converges or diverges. If it converges, find the limit.

$$a_n = \left[\sec\left(\frac{1}{n}\right)\right]^n$$

Question 3. *(5 marks)* Determine whether the series is convergent or divergent. If it is convergent, find its sum.

$$\sum_{n=1}^{\infty} \frac{1+3^{n-1}}{\pi^{n+1}}$$

Question 4. *(5 marks)* Determine whether the series is absolutely convergent, or conditionally convergent, or divergent.

$$\sum_{n=5}^{\infty} \frac{n5^n(-1)^n}{n!}$$

Question 5. *(5 marks)* Determine whether the series is absolutely convergent, or conditionally convergent, or divergent.

$$\sum_{n=3}^{\infty} \frac{(-1)^{n+1}}{\sqrt[5]{n}}$$

Question 6. *(5 marks)* Determine whether the series is convergent or divergent.

$$\sum_{n=2}^{\infty} \frac{\sqrt{n^3+n^4+10}}{\sqrt[3]{n^9+3n^4+2}}$$

Question 7. *(5 marks)* Determine whether the series is convergent or divergent.

$$\sum_{n=2}^{\infty} \frac{\operatorname{arcsec}(n)}{n\sqrt{n^2-1}}$$

Question 8. *(5 marks)* Find the radius of convergence and interval of convergence of the series.

$$\sum_{n=1}^{\infty}(-1)^n \frac{(x+2)^n}{n2^n}$$

Question 9. *(5 marks)* Find the Taylor series for $f(x) = \frac{1}{x^2}$ centered at $x = 2$. Assume that f has a power series expansion. Do not show that $R_n \to 0$.

Bonus Question. *(5 marks)* Show that the series diverges.

$$\sum_{n=1}^{\infty} \frac{\int_1^{\cos\left(\frac{1}{n}\right)} \arctan x \, dx}{3e^{-1/n} - \ln\left(\frac{1}{n}+1\right) + \sin\left(\frac{4}{n}\right) - 3}$$