Math 143 Sample Problems for Exam 2

**Question 1** For each of the following series decide whether the series converges or diverges and circle the appropriate word. Write the name of the test used to decide in the blank. (Show all work.)

a) $\sum_{n=1}^{\infty} \left(2 - e^{(-1/n)}\right)$ Converges Diverges Test Used=

b) $\sum_{n=1}^{\infty} \frac{4^{\sqrt{n}}}{n^2}$ Converges Diverges Test Used=

c) $\sum_{n=1}^{\infty} \frac{2^{3n}}{10^n}$ Converges Diverges Test Used=

d) $\sum_{n=0}^{\infty} \frac{n}{\sqrt{n^2 + 1}}$ Converges Diverges Test Used=

e) $\sum_{n=0}^{\infty} \frac{5n - 3}{n^2 - 2n + 43}$ Converges Diverges Test Used=

f) $\sum_{n=1}^{\infty} \frac{(-1)^n (n!)^2 3^n}{(2n + 1)!}$ Converges Diverges Test Used=

**Question 2** Does the following series converge conditionally, absolutely or diverge:

$$\sum_{n=1}^{\infty} (-1)^n \frac{(\ln n)^{2002} + \sin^2 n}{\sqrt{n^6 + 11}}$$

**Question 3** Find the interval of convergence of the power series:

$$\sum_{n=0}^{\infty} (-1)^n \frac{(3x + 1)^n}{4^n(n + 1)}$$

Don’t forget to check the endpoints!

**Question 4** [20 points] Evaluate the indefinite integral $\int x \cos(3x^3) \, dx$ as a power series.

You will need to know that $\cos x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}$.

**Question 5** Find the Taylor series for $f(x) = \cos x$ centered at the point $x = \pi/4$.

**Question 6** Find the equation of the sphere whose diameter has endpoints $(1, 2, 3)$ and $(-1, 4, -6)$.

**Question 7** Something from sections 13.2 and 13.3 if we get there.