Math 143 Sample Problems for Exam 2

**Question 1** Find the interval of convergence of the power series:

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

Don’t forget to check the endpoints!

**Question 2** Approximate the definite integral \(\int_{0}^{1} x \cos(3x^3) \, dx\) by using the first three non-zero terms of the Maclaurin series for \(f(x) = x \cos(3x^3)\). What is the maximum error in your approximation? You will need to know that \(\cos x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}\).

**Question 3** Find the Taylor series for \(f(x) = \cos x\) centered at the point \(x = \pi/4\).

**Question 4** For the parametric curve \(x = e^t (\cos t + \sin t), y = e^t (\cos t - \sin t)\), find the equation of the tangent line at the point where \(t = \pi/4\). Find the length of the curve from \(t = 0\) to \(t = \pi/2\). Set up, but do not evaluate an integral that represents the area of the surface of revolution gotten by rotating the curve from \(t = 0\) to \(t = \pi/2\) about the \(y\)-axis.

**Question 5** Find the area enclosed by the cardioid \(r = 2 + 2 \cos \theta\). Find the equation of the tangent line to the cardioid at the point when \(\theta = \pi/6\).

**Question 6** Find the length of the spiral \(r = 3^{-\theta}\) from \(\theta = -\pi/2\) to \(\theta = \pi/2\).

**Question 7** Find the equation of the sphere whose diameter has endpoints \((1, 2, 3)\) and \((-1, 4, -6)\).

**Question 8** Something from sections 13.2.