1. Find the Taylor series for the function

$$f(x) = x^5$$

around the point $x = 1$.

(Your answer will have only finitely many terms, because after some point, all the terms are zero.)

2. (a) What is the Maclaurin series (the Taylor series about $x = 0$) for the function $f(x) = e^x$?

   You do not need to show any work for this part of the problem, so if you remember the answer, you can just write it down.

   (b) Find the Maclaurin series for $g(x) = e^{-x^2}$.

   (c) Use the series in part (b) to approximate e^{-1} with an error of at most .01.

3. Find an equation in the form $Ax + By + C = D$ for the plane containing the line

$$\langle x,\, y,\, z\rangle = \langle 1,\, -1,\, 2\rangle + t\,\langle 2,\, 1,\, 3\rangle$$

and the point $C = (2,\, 0,\, 3)$.

4. Consider the lines L_1 and L_2 with vector equations

$$\langle x,\, y,\, z\rangle = \langle 1,\, 2,\, 3\rangle + t\,\langle a,\, 1,\, 0\rangle \quad \text{and} \quad \langle x,\, y,\, z\rangle = \langle 2,\, 0,\, 1\rangle + s\,\langle 1,\, 1,\, 0\rangle$$

respectively. Is it possible to choose the constant a so that the lines intersect? (This is not simply a "YES or NO" question. You must explain how you arrived at your conclusion.)

5. Suppose that $\vec{u} \times \vec{v} = \langle 5,\ 1,\ 1 \rangle$, that $\vec{u} \cdot \vec{u} = 4$, and that $\vec{v} \cdot \vec{v} = 9$. Find $|\vec{u} \cdot \vec{v}|$.

6. Give a set of parametric equations for the line of intersection of the planes $x+2y-3z = 5$ and $5x + 5y - z = 1$.

7. Find the radius of convergence and the interval of convergence for the series

$$\sum_{n=2}^{\infty} \frac{n^2(x-2)^n}{3^n}$$

8. (a) What is the area of the triangle with corners (0, 0, 0), (0, 1, -1) and (1, 0, 1)?

   (b) An object moves with constant velocity of $\mathbf{v} = \langle 4, 2, 0 \rangle$ units per second, while a constant force $\mathbf{F} = \langle 1, 1, 1 \rangle$ is acting on the object. Find the work done by the force after the object has been travelling for 5 seconds.

   (c) Find the vector projection of $\mathbf{b}$ onto $\mathbf{a}$ where $\mathbf{a} = \langle -2, 3, -6 \rangle$ $\mathbf{b} = \langle 5, -1, 4 \rangle$.