

To find the simple in the complex, the finite in the infinite—that is not a bad description of the aim and essence of mathematics.

—Jacob T. Schwartz

1. Find the radius of convergence and the interval of convergence for the power series

$$\sum_{n=1}^{\infty} \frac{(x-2)^n}{n^2 3^n}$$

2. (a) What is the Maclaurin's series for $f(x) = e^x$?
(b) Use the answer to part (a) to obtain the Maclaurin's series for e^{-x^2} .
(c) Use the answer to part (b) to obtain a series for $\int_0^1 e^{-x^2} dx$
3. (a) Find the Maclaurin's series for $f(x) = \frac{2x}{1+x^2}$, and determine its radius of convergence.
(b) Use the answer to part (a) to find the value of $f^{(9)}(0)$.
(c) Use the answer to part (a) to find the Maclaurin's series for $\ln(1+x^2)$.
4. Show that the equation $x^2 + y^2 + z^2 = 6x - 2z$ is the equation of a sphere, and find its center and radius.

5. Given the following two lines

$$L_1 : \frac{x-5}{3} = \frac{y-3}{4} = \frac{z-2}{-1}$$
$$L_2 : \frac{x}{1} = \frac{y-1}{-1} = \frac{z+1}{2}$$

- (a) Find the point of intersection of the line L_1 with the line L_2 .
(b) Find the point of intersection of the line L_2 with the plane $3x + 5y + 2z = 9$.
(c) Find the equation of the plane containing both the lines L_1 and L_2 .
6. Find the distance from the point $(3, -2, 2)$ to the plane $2x - y + 2z = 5$.

You may use your book, your notes, Maple and/or a calculator to do this take home portion of the exam. However, you should not discuss this with anyone until you have completed it.

1. Use a series to approximate $\int_0^1 e^{-x^2} dx$ accurate to four decimal places.
2.
 - (a) Find the Taylor polynomial of degree 6 for $f(x) = \cos(x)$ about $x = \frac{\pi}{6}$ ($a = \frac{\pi}{6}$).
 - (b) Use the Taylor polynomial found above to approximate $\cos(1)$.
 - (c) Use Taylor's inequality to estimate the error in your approximation of $\cos(1)$.
3. Find the direction cosines and the direction angles of the vector $\langle 3, -4, 2 \rangle$.
4. Find the angle between the planes $2x - 3y + 5z = 12$ and $4x + y - 3z = 4$.