$A = p_1 x + p_2 x^2 + \cdots \ldots + p_n x^n$

Then first solve for x and substitute $(1 + r)^{-1} = x$, to find the value of r

# Chapter 11 Multi Variables and their Functions

**Understanding Surfaces and Distance**

For a 3 dimensional figure, the general equation for a plane in space is given by:
$px + qy + rz = s$

Now let us see its economical use,
We can consider each plane or axis to represent a product, then the space is called budget plane, where p, q and r are cost of goods/unit and s is the total value.
Now for a 3D space, we can find the distance between any 2 points on the space,
The formula is given for two point $(p_1, q_1, r_1)$ and $(p_2, q_2, r_2)$

The distance is given by $distance = \sqrt{(p_1 - p_2)^2 + (q_1 - q_2)^2 + (r_1 - r_2)^2}$

Now the equation for a sphere is given for a center $(u, v, w)$ and radius r
$(x - u)^2 + (y - v)^2 + (z - w)^2 = r^2$

# Chapter 12 Comparative Statistics

**A peek into General Cases**:

For partial derivatives when we know $z = f(x, y)$ and c is a constant

$F(x, y, z) = c \implies z'_x = -\dfrac{F'_x}{F'_z}, \quad z'_y = -\dfrac{F'_y}{F'_z} \; for \, F'_z \neq 0$

Now for a more general case,

$F(x_1, x_2, \ldots \ldots, x_n, z) = \dfrac{\partial F / \partial x_i}{\partial F / \partial z}, where \, i = 1, 2, \ldots \ldots, n$

**Understanding Linear Approximation**

The Linear approximation to f(x) about $(x_o, y_o)$ is given by the formula
$f(x, y) \approx f(x_o, y_o) + f'_1(x_o, y_o)(x - x_o) + f'_2(x_o, y_o)(y - y_o)$

Where, $f'_1(x_o, y_o)$, stands for first derivative of $(x_o, y_o)$ in terms of x and $f'_2(x_o, y_o)$ stands for the first derivative of $(x_o, y_o)$, in terms of y.
Now one can generalize the above equation to re-write it for functions of several variables
Linear approximation to $z = f(x) = f(x_1, \ldots \ldots x_n)$ about $x^0 = (x_1^0, \ldots \ldots, x_n^0)$
$f(x) \approx f(x^0) + f'_1(x^0)(x - x^0) + \ldots \ldots \ldots + f'_n(x^0)(x_n - x_n^0)$

Again $f'_n(x^0)$ stands for the first derivative in terms of the nth variable in the equation