$$4A\frac{\mathrm{d}A}{\mathrm{d}t} = x(y^2+z^2)\frac{\mathrm{d}x}{\mathrm{d}t} + y(z^2+x^2)\frac{\mathrm{d}y}{\mathrm{d}t} + z(x^2+y^2)\frac{\mathrm{d}z}{\mathrm{d}t}$$

When P is at P_O(6, 0, 0), then Q is at Q_O(0, 9, 0) and R is at R_O(0, 0, 12) with $|P_O\ Q_O\ R_O|_2 = 9\sqrt{61}$. Then

$$4.9\sqrt{61}\frac{\mathrm{d}A}{\mathrm{d}t} = 6(225)2 + 9(680)3 + 12(117)4$$
$$9\sqrt{61}\frac{\mathrm{d}A}{\mathrm{d}t} = 675 + 27.45 + 12.117$$
$$\sqrt{61}\frac{\mathrm{d}A}{\mathrm{d}t} = 75 + 135 + 156 = 366$$
$$\frac{\mathrm{d}A}{\mathrm{d}t} = \frac{766}{\sqrt{61}} = 6\sqrt{61}unit^2/sec$$

0.1. TAYLOR'S FORMULA AND SERIES.

THEOREM 0.1. *If f(x, y) has continuous partial derivatives up to order n+1 in a neighborhood of (a, b)$\epsilon\upsilon_f$, then*

$$f(x,y) = f(a,b) + \sum_{k=1}^{n}\frac{1}{k!}((x-a)\frac{a}{ax} + (y-b)\frac{a}{ay})^k f(x,y)|_{(a,b)} + R_{n+1}$$

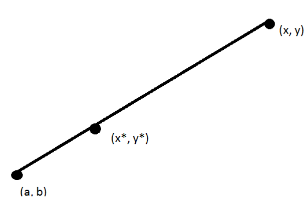
where the remainder is given by

$$R_{n+1} = \frac{1}{(n+1)!}((x-a)\frac{a}{ax} + (y-b)\frac{a}{ax})^{n+1} f(x,y)_{(x*,y*)}$$

with (x, y*) a point on the open segment (P_OP) joining P_O(a, b) to P(x, y)*

PROOF. Since every point of the line segment [P_OP] can be represented parametrically as

$$x = a + ht, \qquad y = b + kt \qquad 0 \le t \le 1,$$



The end points of the segment correspond to t=0 and t=1 (observe that h, k are direction numbers of the line segment) Substituting (2) in f(x, y) gives the function

□