$P(t) = e + dt$

$f(p) = 0 \qquad f(e+dt) = 0$

Sphere eq: $(x-x_c)^2 + (y-y_c)^2 + (z-z_c)^2 - R^2 = 0$

$(P-C)\cdot(P-C) - R^2 = 0$

$(e+dt-c)(e+dt-c) - R^2 = 0$

$e^2 + edt - ec + d^2t^2 + edt - dtc + c^2 - ec - dtc - R^2 = 0$

$\underline{e^2 + d}^2t^2 + c^2 + 2edt - 2ec - 2dtc - R^2 = 0$

$d^2t^2 + 2edt - 2cdt + e^2 + c^2 - R^2 - 2ec = 0$

$\underline{(d\cdot d)}t^2 + \underline{2d(e-c)}t + \underline{e^2 + c^2 - 2ec - R}^2 = 0$

$a = d^2$

$b = 2d(e-c)$

$c = e^2 + c^2 - 2ec - R^2$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = x$$

$$\frac{-2d(e-c) \pm \sqrt{(2d(e-c))^2 - 4\cdot d^2 \cdot (e^2 + c^2 - 2ec - R^2)}}{2\cdot d^2} = t$$

$x^2 =$ $\qquad (x-x_c)^2 + (y-y_c)^2 \qquad (P-C)^2$

$(P-C)^2 - R^2 = 0$

$P = e + dt$

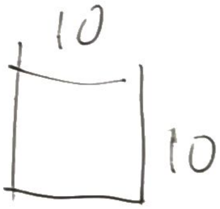
$C = c$

$(x-x_c)^2 + (y-y_c)^2 + (z-z_c)^2 - R^2 = 0$

$(P-C)^2$ //

$\vec{a} \cdot \vec{b} = a_x \cdot b_x + a_y \cdot b_y$ | dot product

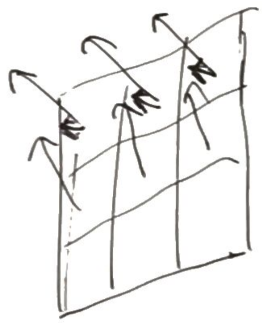
$x + y + z = r$

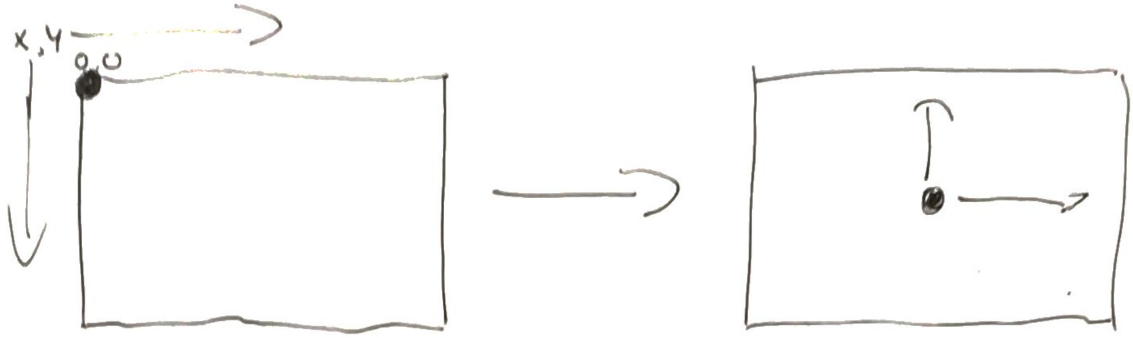


100 pixels

$x = 2$ → $x = 3$

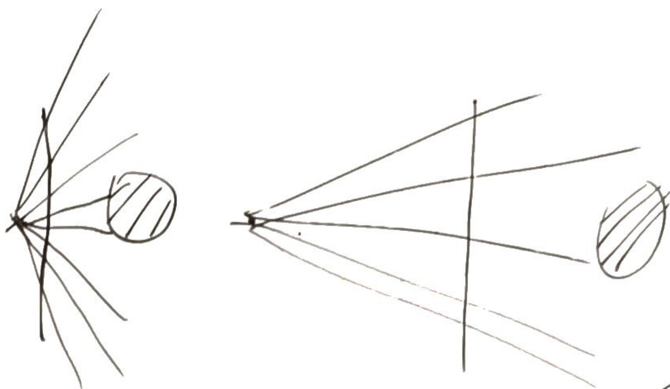
$y = 10$ → $y = 1$





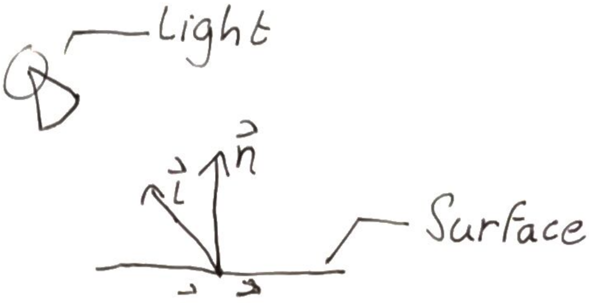
$$5\cdot5 + 6\cdot6 - 2(5\cdot6)$$
$$5\cdot5 + 6\cdot6 - 5\cdot6 - 5\cdot6$$

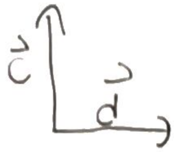
$t \approx 2$



$$\vec{a} = (1, 2, 3)$$
$$b = (4, 5, 6)$$

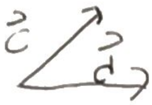
$$\vec{a} \cdot \vec{b} = 1 \cdot 4 + 2 \cdot 5 + 3 \cdot 6 = 4 + 10 + 18 = 32$$



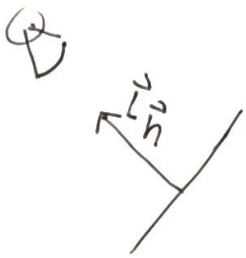


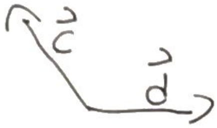
$\vec{c} \cdot \vec{d} = 0$

$\vec{l} \cdot \vec{n} > 0$



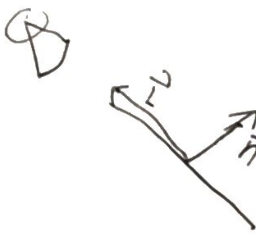
$\vec{c} \cdot \vec{d} > 0$





$\vec{c} \cdot \vec{d} < 0$

$\vec{l} \cdot \vec{n} = 1$



$\vec{L} \cdot \vec{n} < 0$

$$|\vec{n}| = 1$$
$$|\vec{L}| = 1$$

$\frac{dy}{dx} \rightarrow f'(x)$

$f(x,y) = x^2 - 2xy$ 2 inputs. Thus partial d (∂)

$\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}$

$f(x,y) = x^2 y^3$

$\frac{\partial f}{\partial x} = \frac{\partial}{\partial x} x^2 y^3$ y as const

$\frac{\partial}{\partial x} = 2xy^3$

$\frac{\partial y}{\partial x} = \frac{\partial}{\partial x} = \frac{1}{5}(x^2 - 2xy) + 3$

$= \frac{1}{5}x^2 - \frac{2}{5}xy$

$= \frac{2}{5}x - \frac{2}{5}y$