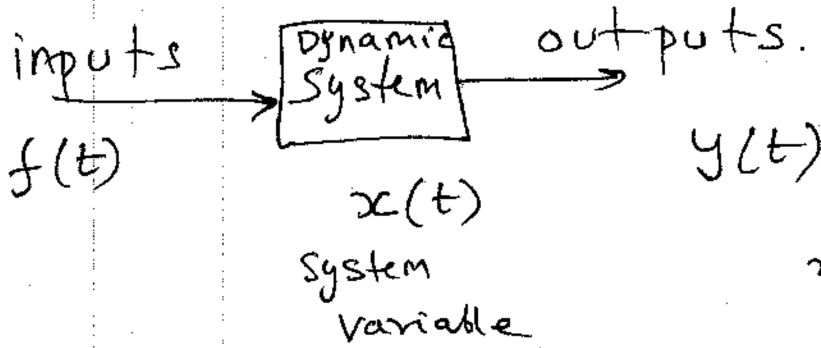
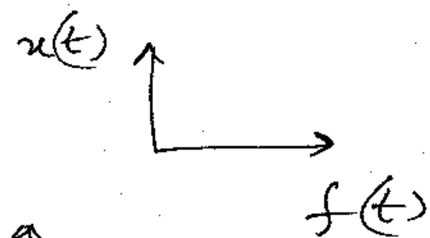
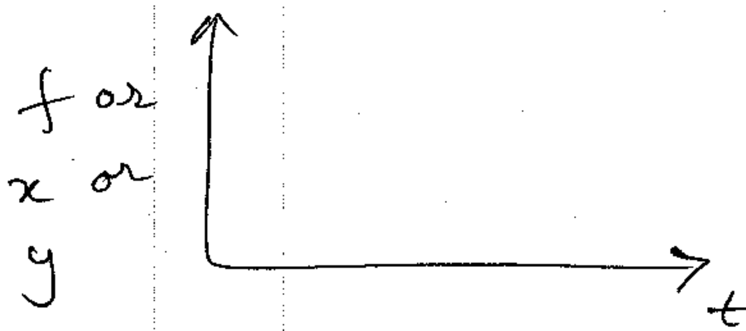
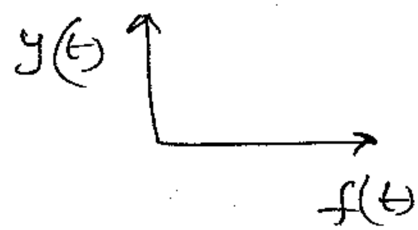
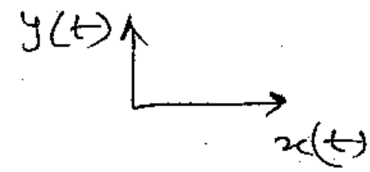


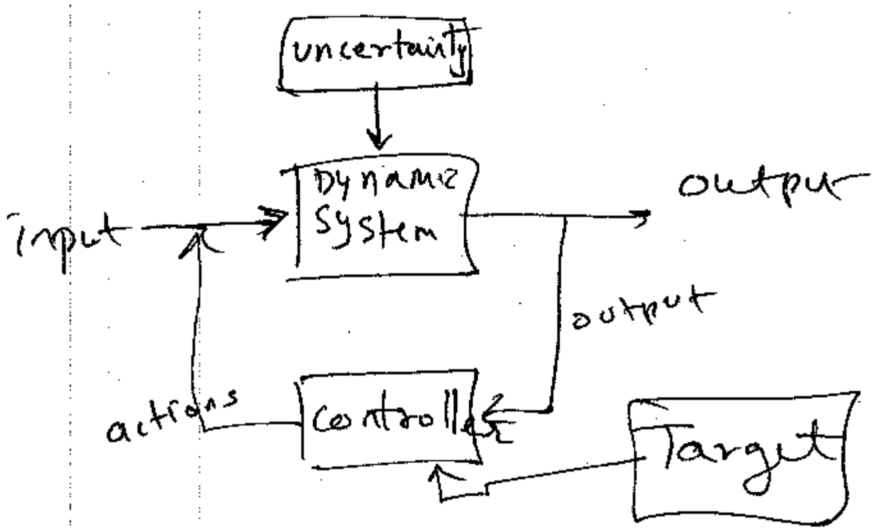
$y(t) = \ldots$
$\dot{x}(t) = \ldots$
$x(t) = \ldots$



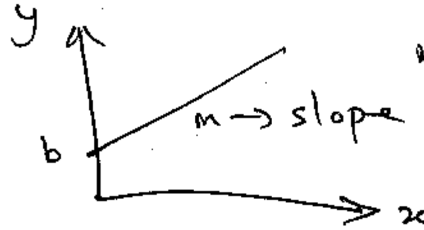




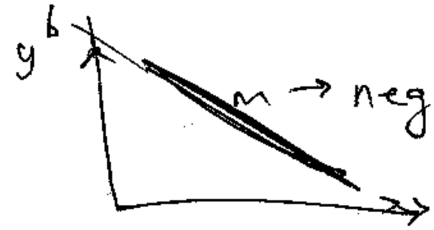




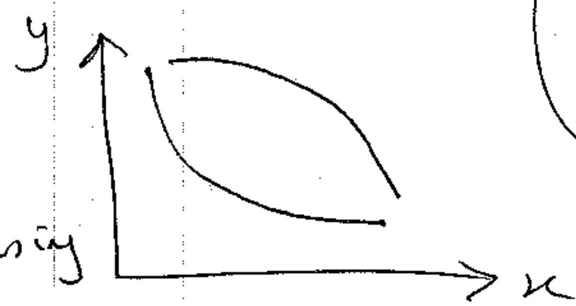
linear $y = mx + b$



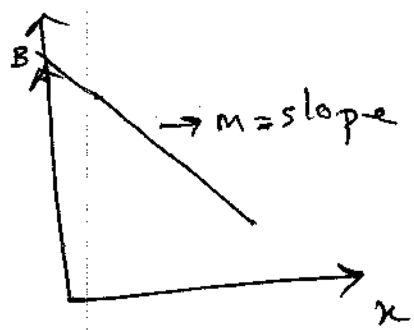
m is positive



Exponential $y = be^{mx}$



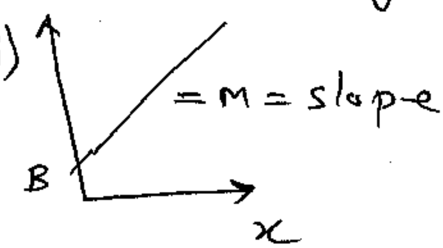
~~Expo~~ Decreasing function



$Y = \ln(y)$

$$Y = B + mx$$

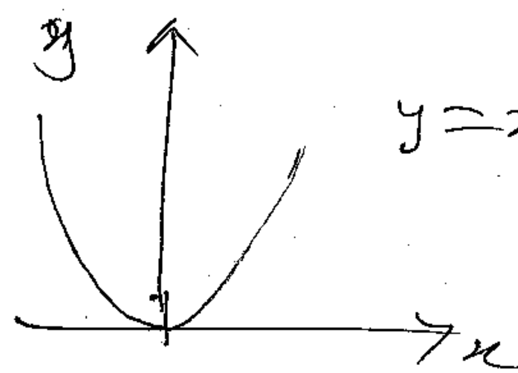
Exp increasing function



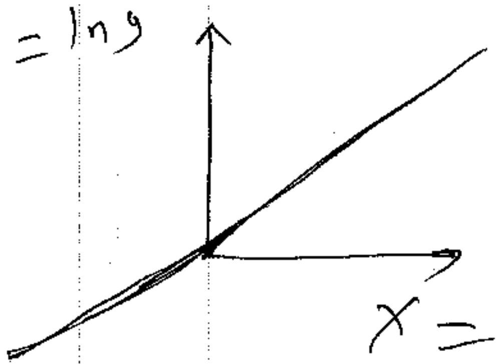
Power $y = b\,x^{M}$

$$Y = B + mX$$

$Y \uparrow \ln(y)$, $B \uparrow \ln(b)$, $X \uparrow \ln(x)$

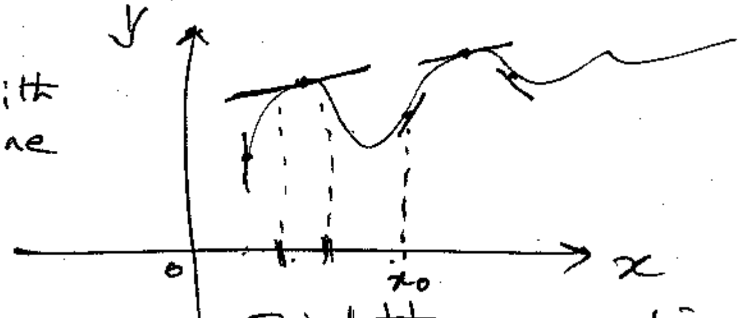


$y = x^2$



Linearization

Idea :- To approximate the curve with a straight line



Taylor series.

$y = f(x) = f(x_0) + f'(x_0)(x - x_0) + \ldots\ldots$

Find the equation of the tangent to a point x_0 on the curve $y = f(x)$

$f'(x_0)$ gives the slope of the tangent at x_0

(The first derivative of y) $= \frac{dy}{dx}$ at x_0

Example $y = f(x) = x^2 - 3x + 5$. Find the tangent at $x_0 = 1$

Can I linearize the curve at $x_0 = 1$?

✓ $f(x_0) = 1 - 3 + 5 = 3 = f(1)$

$f'(x_0) =$

$f'(x) = \frac{dy}{dx} = 2x - 3$

✓ $f'(x_0) = 2x_0 - 3 = (2 \times 1) - 3 = -1$

$y = 3 + (-1)(x - 1) = 3 - x + 1 = 4 - x$

$$\boxed{y = 4 - x}$$