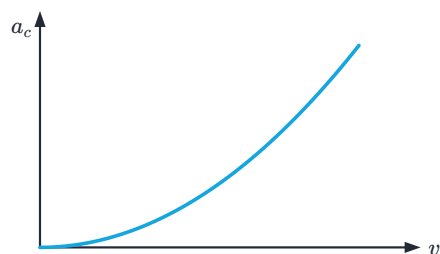
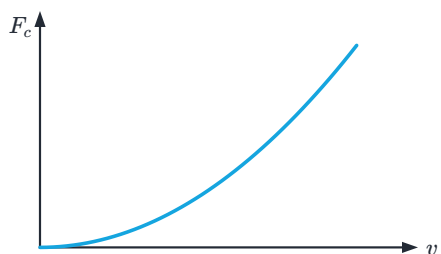


### Centripetal acceleration and force vs speed



$$a_c = \frac{v^2}{r}$$

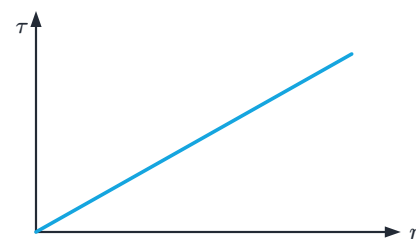
- Parabolic in  $v$  at constant  $r$



$$F_c = \frac{mv^2}{r}$$

- Parabolic in  $v$  at constant  $m$  and  $r$

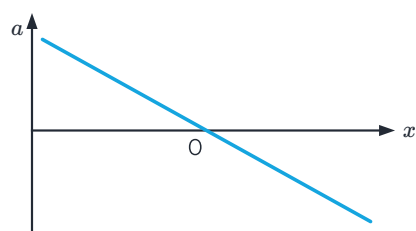
### Torque vs lever arm



$$\tau = rF \sin \theta$$

- For constant  $F$  and  $\theta$ : straight line
- Slope =  $F \sin \theta$

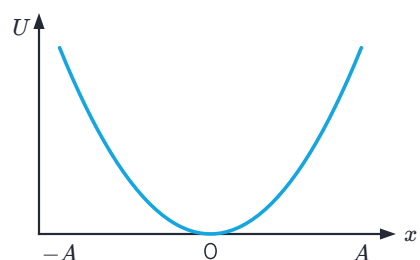
### Acceleration vs position



$$a = -\omega^2 x$$

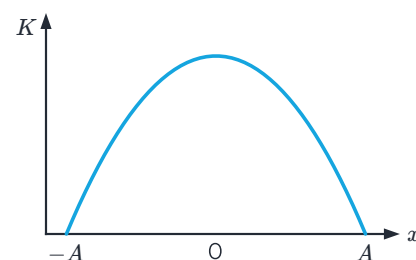
- Straight line with negative slope
- Acceleration is toward equilibrium

### Potential energy vs position



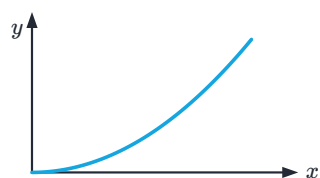
- Parabola opening upward
- Minimum at equilibrium

### Kinetic energy vs position

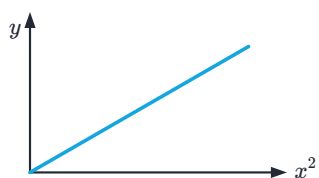


- Inverted parabola
- Maximum at equilibrium
- Zero at  $\pm A$

### Linearizing a quadratic relationship

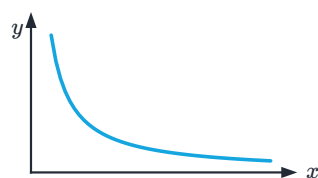


$$y \propto x^2$$

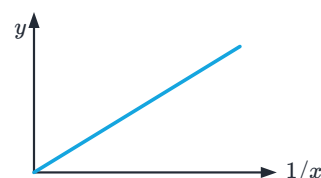


$$\text{Plot } y \text{ vs } x^2: \text{ a straight line through the origin}$$

### Linearizing an inverse relationship



$$y \propto \frac{1}{x}$$



$$\text{Plot } y \text{ vs } \frac{1}{x}: \text{ a straight line through the origin}$$