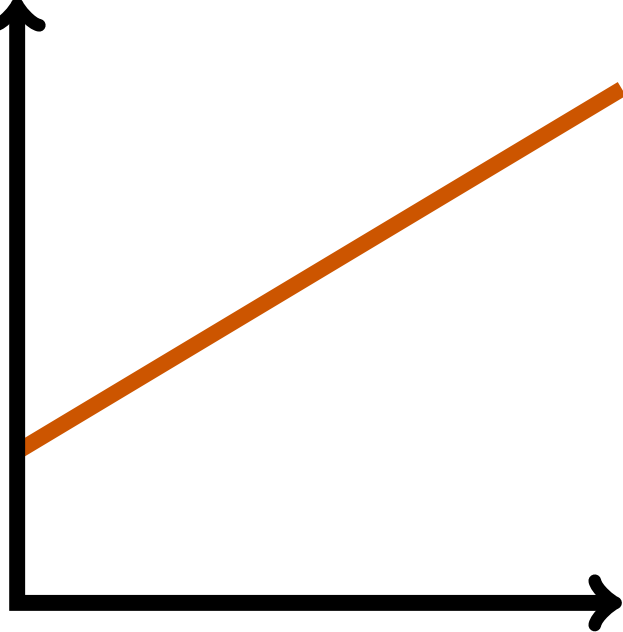
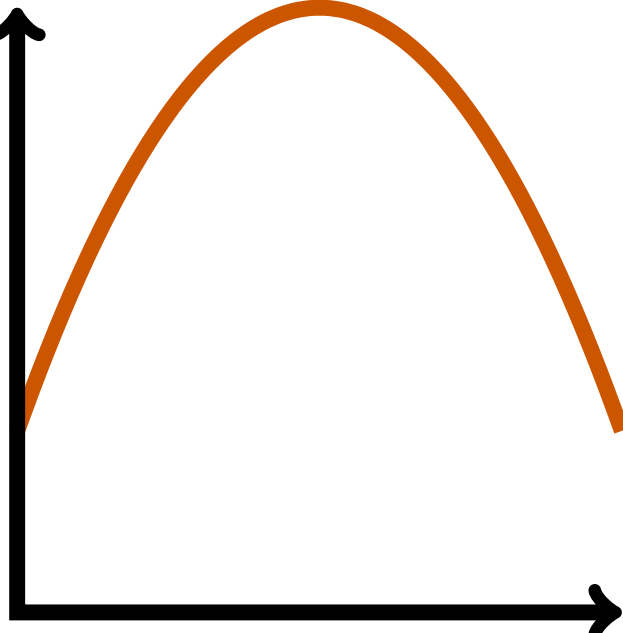
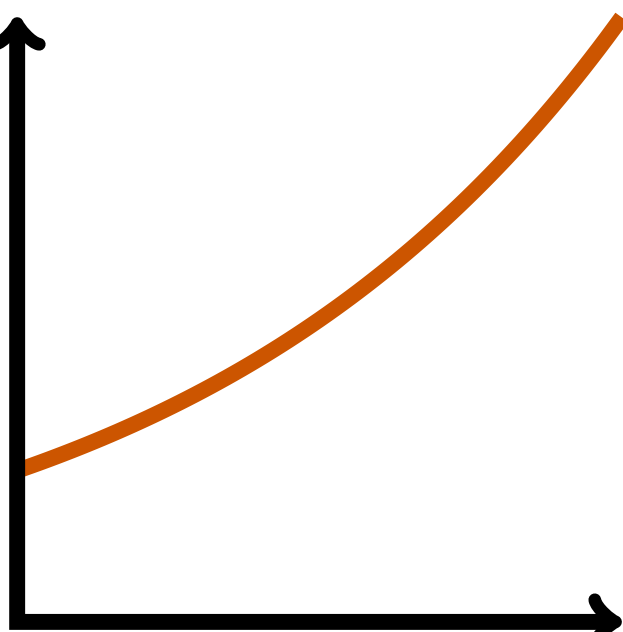
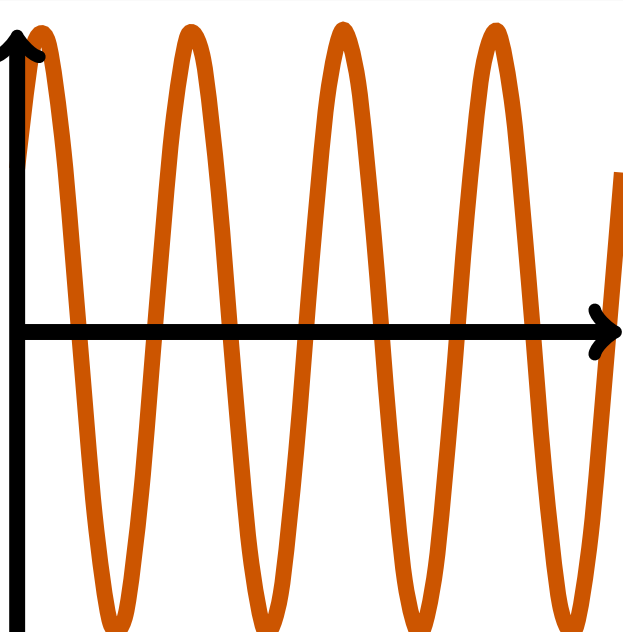


Basic Classes of Mathematical Models

with sample equations

Mathematical model	Kind of change	Graph shape
Linear model $y = Ax + B$ $\frac{dy}{dx} = A$	Rate of change is constant.	
Quadratic model $y = Ax^2 + Bx + C$ $\frac{d^2y}{dx^2} = A$	Rate of change of rate of change is constant.	
Exponential model $y = Ab^x$ or $y = Ae^{\frac{x}{\xi}}$ $\frac{dy}{dx} = \ln b \cdot y$ or $\frac{dy}{dx} = \frac{y}{\xi}$	Rate of change is proportional to amount.	
Harmonic model $y = A \cos(kx + \phi)$ or $y = A \sin(kx + \phi')$ or $y = \Re e \{ Ae^{i(kx + \phi)} \}$ $\frac{d^2y}{dx^2} = -k^2 y$	Rate of change of rate of change is proportional to amount.	
Sudden change model $y = A \theta(x - x_0) + B$ $\frac{dy}{dx} = A \delta(x - x_0)$	Change is finite and instantaneous.	