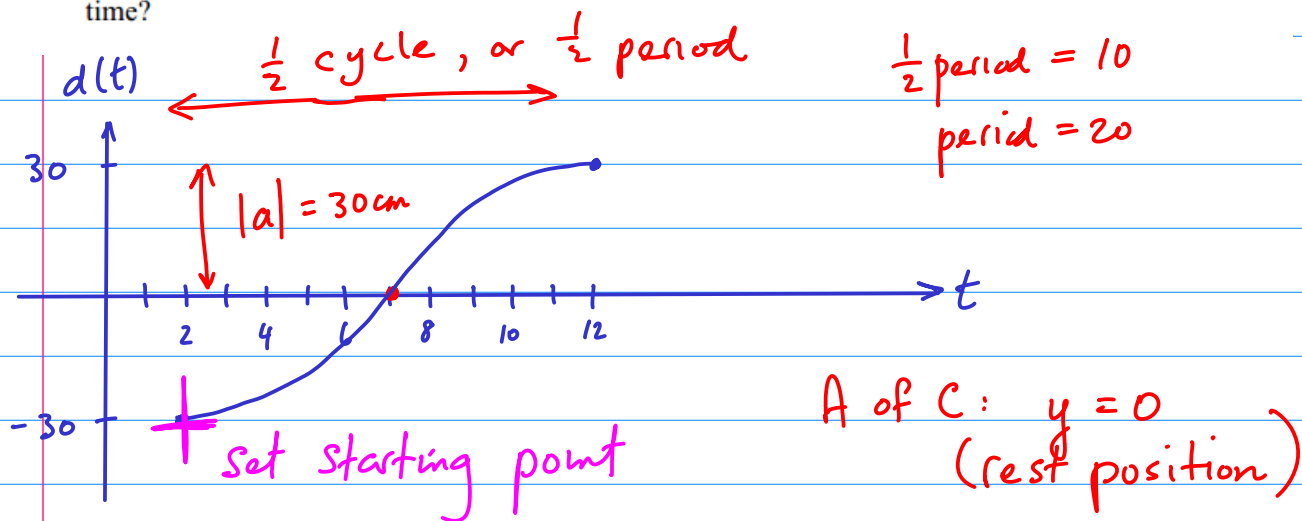


5. Skyscrapers sway in high-wind conditions. In one case, at $t=2\text{ s}$, the top floor of a building swayed 30 cm to the left (-30 cm) and at $t=12\text{ s}$, the top floor swayed 30 cm to the right ($+30\text{ cm}$) of its starting position.

a) What is the equation of a sinusoidal function that describes the motion of the building in terms of time?



$$k = \frac{360^\circ}{\text{period}}$$

$$= \frac{360^\circ}{20}$$

$$= 18^\circ$$

$$p = 2$$

$$a = -30 \text{ (reflected cosine)}$$

$$d(t) = -30 \cos[18^\circ(t-2)]$$

- b) Dampers, in the forms of large tanks of water, are often added to the top floors of skyscrapers to reduce the severity of the sways. If a damper is added to this building, it will reduce the sway (not the period) by 70%. What is the equation of the new function that describes the motion of the building in terms of time?

(b) Reduce sway \rightarrow reduce amplitude

$$|a|_{\text{new}} = |a|_{\text{old}} (100\% - 70\%)$$

original amount

reduction

$$|a|_{\text{new}} = 30(0.3)$$

$$= 9$$

$$\therefore d(t) = -9 \cos[18^\circ(t-2)]$$