Solutions

Each answer shows the steps, then the **result**.

2.1

- linear speed of a point at radius r:

$$v = \omega r = (8 \text{ rad s}^{-1})(0.5 \text{ m})$$

- $v = \mathbf{4}$ m s^{-1}

2.2

- It is proportional to the distance from the axis (farther is faster)

2.3

- tangential acceleration:

$$a_t = \alpha r = (3 \text{ rad s}^{-2})(2 \text{ m})$$

- $a_t = \mathbf{6}$ m s^{-2}

2.4

- $v = \omega r$, rearranged for ω:

$$\omega = \frac{v}{r} = \frac{6 \text{ m s}^{-1}}{0.2 \text{ m}}$$

- $\omega = \mathbf{30}$ rad s^{-1}

3.1 B

- $v = \omega r$

3.2 B

- the rim (larger r) moves faster

3.3

(a)

- $v = \omega r$, rearranged for ω:

$$\omega = \frac{v}{r} = \frac{7 \text{ m s}^{-1}}{0.35 \text{ m}}$$

- $\omega = \mathbf{20}$ rad s^{-1}

(b)

- Zero – the contact point is instantaneously at rest

3.4

(a)

- tangential acceleration:

$$a_t = \alpha r = (20 \text{ rad s}^{-2})(0.1 \text{ m})$$

- $a_t = \mathbf{2}$ m s^{-2}

(b)

- Less (smaller r)