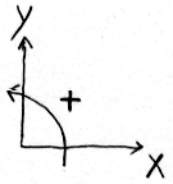
Quiz #8 Solutions



$$\vec{v}_B = \vec{v}_A + \vec{\omega}_{AB} \times \vec{r}_{B/A}$$

$$v_B \hat{j} = -1.5\,\hat{i} + (\omega_{AB}\hat{k}) \times (0.15\sqrt{2}\,\hat{i} + 0.15\sqrt{2}\,\hat{j})$$

$$v_B \hat{j} = -1.5\,\hat{i} + 0.15\,\omega_{AB}\sqrt{2}\,\hat{j} - 0.15\,\omega_{AB}\sqrt{2}\,\hat{i}$$

$$0\hat{i} = -1.5\,\hat{i} - 0.15\,\omega_{AB}\sqrt{2}\,\hat{i}$$

$$\omega_{AB} = \frac{1.5}{-0.15\sqrt{2}} = -7.07 \text{ rad/s}$$

$$\vec{a}_B = \vec{a}_A + \vec{\alpha}_{AB} \times \vec{r}_{B/A} - \omega_{AB}^2 \vec{r}_{B/A}$$

$$a_B \hat{j} = 16\,\hat{i} + (\alpha_{AB}\hat{k}) \times (0.15\sqrt{2}\,\hat{i} + 0.15\sqrt{2}\,\hat{j}) - (-7.07)^2 (0.15\sqrt{2}\,\hat{i} + 0.15\sqrt{2}\,\hat{j})$$

$$a_B \hat{j} = 16\,\hat{i} + 0.15\,\alpha_{AB}\sqrt{2}\,\hat{j} - 0.15\,\alpha_{AB}\sqrt{2}\,\hat{i} - 7.5\sqrt{2}\,\hat{i} - 7.5\sqrt{2}\,\hat{j}$$

$$0\hat{i} = 16\,\hat{i} - 0.15\,\alpha_{AB}\sqrt{2}\,\hat{i} - 7.5\sqrt{2}\,\hat{i}$$

$$\alpha_{AB} = \frac{16 - 7.5\sqrt{2}}{0.15\sqrt{2}} = 25.4 \text{ rad/s}^2$$

$$\boxed{\vec{\alpha}_{AB} = (25.4 \text{ rad/s}^2)\,\hat{k}}$$

$$a_B \hat{j} = 0.15\,\alpha_{AB}\sqrt{2}\,\hat{j} - 7.5\sqrt{2}\,\hat{j}$$

$$a_B = 0.15(25.4)\sqrt{2} - 7.5\sqrt{2} = -5.21 \text{ m/s}^2$$

$$\boxed{\vec{a}_{AB} = (-5.21 \text{ m/s}^2)\,\hat{k}}$$