SOLUTIONS

## PROBLEM: AP-6

**GIVEN:** The position of a crate sliding down a ramp is given by $x = (0.25t^3)$ m, $y = (1.5t^2)$ m, $z = (6 - 0.75t^{5/2})$ m, where $t$ is in seconds. Determine the magnitude of the crate's velocity and acceleration when $t = 2$ s.

$$x = 0.25\,t^3$$
$$y = 1.5\,t^2$$
$$z = 6 - 0.75\,t^{5/2}$$

**REQUIRED:**

$$|v|$$

$$|a|$$

**SOLUTION:**

AT $t = 2s$

| | | |
|---|---|---|
| $\dot{x} = 0.75\,t^2$ | $= v_x$ | $= 3\ ^m/_s$ |
| $\ddot{x} = 1.50\,t$ | $= a_x$ | $= 3\ ^m/_{s2}$ |
| $\dot{y} = 3t$ | $= v_y$ | $= 6\ ^m/_s$ |
| $\ddot{y} = 3$ | $= a_y$ | $= 3\ ^m/_{s2}$ |
| $\dot{z} = -1.875\,t^{3/2}$ | $= v_z$ | $= -5.30\ ^m/_s$ |
| $\ddot{z} = -2.815\,t^{1/2}$ | $= a_z$ | $= -3.98\ ^m/_{s2}$ |

$$v = \sqrt{\dot{\xi}^2} = 8.55\ ^m/_s$$

$$a = \sqrt{\ddot{\xi}^2} = 5.82\ ^m/_{s2}$$

$$v = 8.55\ ^m/_s$$
$$a = 5.82\ ^m/_{s2}$$
$$AT\ t = 2s$$