Physics 1214, Homework #8: solutions

Answers to multiple choice questions: M1: B; M2: B; M3: (a) B, (b) E.

P1: (a) $\mathbf{A} \cdot \mathbf{B} = 2$, $\mathbf{A} \times \mathbf{B} = \mathbf{i} - \mathbf{j}$

(b) $2^2 + (\sqrt{2})^2 = (\sqrt{2}\sqrt{3})^2$

(c) yes, because $\cos^2 \varphi + \sin^2 \varphi = 1$

P2: $T \sin\theta = m\omega^2 r \qquad T\cos\theta = mg \qquad \omega = \sqrt{\frac{g}{r}\tan\theta} \qquad r = l\sin\theta$

$$L = I\omega = mr^2\omega = m\sqrt{gr^3\tan\theta} = m\sqrt{g(l\sin\theta)^3\tan\theta} = 4.85 \times 10^{-2}\ \text{kg}\cdot\text{m}^2/\text{s}$$

P3: $\mathbf{r} = 2t^3\mathbf{i} + t^2\mathbf{j} \qquad \mathbf{L} = \mathbf{r} \times m\mathbf{v} = -2mt^4\mathbf{k} \qquad$ At $t = 2$ s, $L_z = -32\ \text{kg}\cdot\text{m}^2/\text{s}$

P4: $\omega_f = \omega_i \dfrac{I_2}{I_1 + I_2} = 0.941\ \text{rad/s}$