Section 9.1

Problem 9.A: A car moves with constant speed v on a circular track of radius R. In order for the car not to slip on the road, the road bed is banked. **(a)** What angle of bank is needed so that there is no sliding force of the wheels against the road? Explain why this bank angle (from the horizontal) is the same as that a pendulum bob in equilibrium would have (from the vertical) if hanging from the inside roof (ceiling) of the moving car. **(b)** By what factor has the force of the car on the road increased relative to the car's weight?

Problem 9.B: **(a)** Use equation (9.12) of the text to verify that the tidal force vector $\mathbf{F}_{tid}$ at point Q in figure 9.4 is downward. **(b)** Show explicitly how to get equation (9.13) of the text from equation (9.12), recalling that $U = -\int \mathbf{F} \cdot d\mathbf{r}$, where the vector **r** in this problem is just the vector **d**, and that d_o is a constant.

Section 9.3

Problem 9.C: A race car is driving at 200 mph in a direction exactly NW at latitude 45 degrees on the surface of the Earth. What is the acceleration vector (in m/s^2) of the car as seen from a fixed point in space? [Hint: Choose an appropriate coordinate system and write the velocity vector **v** in m/s, as seen in the frame of the rotating Earth. The Earth rotates once in 24 h—from which you can determine its angular velocity vector ω].