

1.
 - a. No, it is not possible to go around a curve without acceleration – if there is no acceleration there is no change in velocity and the object will move in a straight line.
 - b. Yes, a certain type of curve can be accomplished with constant acceleration – one example is the parabolic curve followed by a projectile, during which the acceleration is constantly 9.8 m/s^2 down.
 - c. Circular motion with constant speed is not constant acceleration because the acceleration vector changes direction so that it always points to the center.
2.
 - a. 22.0 m/s
 - b. 9.65 m/s^2 toward center
 - c. 5940 N
3.
 - a. 66.6 ms
 - b. 19.1 m/s , 270.0°
 - c. 1800 m/s^2 , 180.0°
 - d. 36.0 N , 180.0°
 - e. 1.15 km
4.
 - a. 4.5 m/s
 - b. 1.1 s
5.
 - a. toward the center
 - b. 1.1 , 2.2 , 3.3 m/s^2
 - c. friction
 - d. 0.34 – With this value of μ_s there is enough friction acting on the coin (of any mass) to cause an acceleration of 3.3 m/s^2 . With less friction than this the inertia of the coin will cause it to slide off the record in a tangent direction.
6. $r = \frac{mg}{4\rho^2 f^2}$
7.
 - a. $2.64 \times 10^7 \text{ m/s}^2$
 - b. 26.4 kN toward the center
 - c. $126,000 \text{ rpm}$
8.
 - a. 14 m/s
 - b. 95 m/s^2
 - c. The centripetal force is the normal force of the wall pushing inward on the person.
 - d. 0.10
9.
 - a. 3.27 N
 - b. 951 N
 - c. 948 N , 90°
10.
 - a. $a = \frac{2\rho v}{T}$
 - b. $a = \frac{4\rho^2 r}{T^2}$
11.
 - a. $0.22 \text{ kN} \leq F_N \leq 3.0 \text{ kN}$
 - b. 8.9 m/s
12.
 - a. 15 m/s
 - b. 110 m
 - c. 8.6 kN
 - d. 0.80

13. $t = \rho \sqrt{\frac{r}{ng}}$

14. A force that acts perpendicular to an object's velocity (continuously) will cause that object to move in a circular path with uniform speed. The force must be toward the center to cause acceleration toward the center. Without force the object would continue on its tangent path due to its inertia. The force cannot at all point in the direction of the velocity or opposite to the direction of the velocity without changing the speed, therefore it points perpendicular to the velocity.
15. As you round a curve in a car your body has a natural tendency to move in a tangent direction due to its inertia. This is what makes you feel like there is an outward pushing force when there is not. The inward pulling force comes from the seatbelt, your hands on the wheel, and friction with the seat.
16. 1300 g