Velocity /Acceleration Review

1. A peregrine falcon, the fastest flying bird on Earth, can fly 2.5 x 10^2 km/h. The fastest fish, the sailfish, can swim 1.2 x 10^2 km/h. Suppose you have a friend who lives on an island 16 km away from the shore. You send a message to that friend using a falcon as a messenger, and your friend immediately sends an answer with a trained sailfish. What is the average speed at which the message travels? *(1.6 x 10^2 km/h)*

2. The fastest speed ever achieved by a vessel on the water is 555 km/h, which was achieved in 1977 off the coast of Australia. Suppose the vessel undergoes an average acceleration of 1.8 m/s^2. How long will it take the vessel to reach its maximum speed if it starts at rest? *(86 s)*

3. In England, two men built a tiny motorcycle with a wheelbase (the distance between the centers of the two wheels) of just 108 mm and wheels measuring 19 mm in diameter. The motorcycle was ridden over a distance of 1.00m. Suppose the motorcycle has constant acceleration as it travels this distance so that its final speed is 0.800 m/s. How long does it take the motorcycle to travel the distance of 1.00 m? *(2.50 s)*

4. Some cockroaches can run as fast as 1.5 m/s. Suppose that two cockroaches are separated by a distance of 60.0 cm and that they begin to run toward each other at the same moment. Both insects have constant acceleration until they meet. The first cockroach has an acceleration of 0.20 m/s^2 in one direction, and the second one has an acceleration of 0.12 m/s^2 in the opposite direction. How much time passes before the two insects bump into each other? *(1.9 s)*

5. In 1970, a rocket-powered car called *Blue Flame* achieved a maximum speed of 1.00 x 10^3 km/h. Suppose the magnitude of the car's constant acceleration is 5.56 m/s^2. If the car is initially at rest, what is the distance traveled during its acceleration? *(6.95 x 10^3 m)*

6. The famous Gateway to the West Arch in St. Louis is about 192 m tall at its highest point. Suppose Sally, a stunt woman, jumps off the top of the arch. Sally's downward acceleration has a magnitude of 9.0 m/s^2 due to air resistance. Calculate the time it takes Sally to land on the safety pad at the base of the arch. *(6.6 s)*