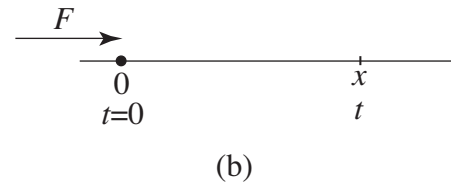
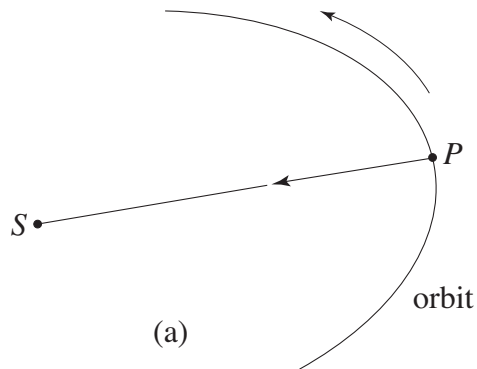


Quiz**Name**

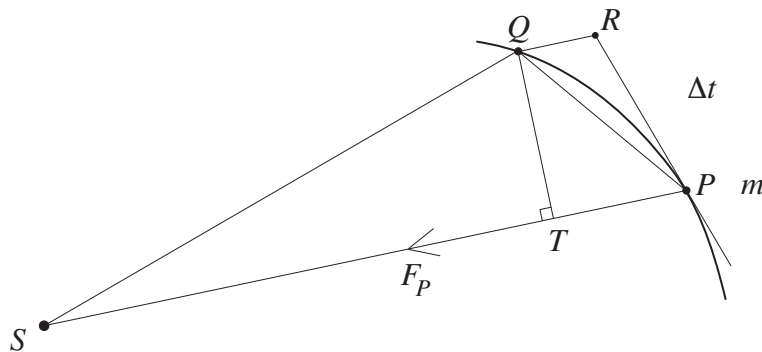
1. Figure (a) depicts a point-mass P in orbit around a fixed point S . The point-mass is subject to a single force that is centripetal in the direction of S .



1a. Newton verifies Kepler's second law by showing that a certain ratio is a constant. Explain what this ratio is and in what sense it is constant.

1b. Figure (b) shows part of a coordinate axis. The point depicts a point-mass of mass m . It is at rest at the origin 0. At time $t = 0$, a constant force of magnitude F begins to act on the point pushing it to the right. After a time $t > 0$, the point has moved a distance x . Verify that $x = \frac{F}{2m}t^2$.

2. Suppose that a point-mass P is driven in its orbit by a centripetal force that points in the direction of a fixed point S . Suppose also that this orbit is an ellipse, parabola, or hyperbola and that S is at a focal point of the orbit. Newton uses the diagram below in his verification of the formula $F_P = \frac{8\kappa^2 m}{L} \frac{1}{r_P^2}$.



2a. What do the various symbols in the formula represent? Which of them are constants and which are variable quantities?

2b. Provide two approximations—one of them a consequence of the conclusion of 1a of the previous page, and the other a consequence of conclusion 1b—that together form the basis of Newton's verification of this formula.