Uniform Circular Motion

1. An object that moves in a circle at a constant speed v is said to experience uniform circular motion. The magnitude remains constant but the direction is constantly changing.

2. Since the direction is constantly changing the velocity is constantly changing. Since the velocity is constantly changing the object is continuously accelerating even though the speed does not change.

3. The acceleration is said to point to the centre of the circle and therefore is called centripetal acceleration (centre seeking) or radial acceleration.

$$a_r = v^2/r$$

4. The speed may be found by using $v = (2\pi r)/T$ and the period may be found by $T = 1/f$.

Example 5-2 page 115: The moon's nearly circular orbit about the Earth has a radius of about 384000km and period of 27.3 days. Determine the acceleration of the moon towards the Earth.

$$v = (2\pi r)/T$$

$$a_r = v^2/r$$

$$a_r = (2\pi r)^2/(T^2 r)$$

$$a_r = (4\pi^2 r)/T^2$$

$$a_r = (4 \times \pi^2 \times 3.84 \times 10^8 m)/(27.3 \times 24 \times 3600)$$

$$a_r = 2.72 \times 10^{-3} m/s^2$$