Answer on Question #48597, Physics, Other

A train runs at a speed of 117.5 m/s.

If the train goes in a straight line over a hill, which has curvature at the peak of the hill of k = 436m, what is the perceived gravity at the peak of the hill. Curvature defined as 1/R where R is the radius of convergence

Solution:

Perceived gravity is just the definition of weight in the trains' frame of reference. Then the weight field is equal to actual gravity g minus acceleration a of the centre of mass of the train:

$$g_p = g - a_r$$

Centripetal acceleration is part of moving in a circular path. Centripetal acceleration points toward the center of the circular path of the train, but is felt by passengers as a force pushing them to the outer edge of the circular path.

The equation for centripetal acceleration is:

$$a_r = \frac{v^2}{r}.$$

Where a_r is centripetal acceleration, v is velocity in meters per second, and r is the radius of the circle in meters.

Thus,

$$g_p = 9.81 - \frac{117.5^2}{436} = -21.86 \text{ m/s}^2$$

Answer: $g_p = -21.86 \text{ m/s}^2$