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Use the summary of equations given above and appropriate graphing technology, where necessary, to answer the following questions. Use $g = 10\,\text{m s}^{-2}$.

1 A projectile is fired at an angle of 45° to the horizontal with an initial velocity of $10\sqrt{2}\ \text{m s}^{-1}$.

- **(a)** Write the equation of the trajectory if there is no air resistance.
- **(b)** If air resistance is proportional to the velocity of the projectile, with $k = 0.01$, write the equation of the trajectory in parametric and Cartesian form.
- **(c)** If air resistance is proportional to the square of the velocity of the projectile, with $k = 0.01$, write the equation of the trajectory in parametric form.
- **(d)** Determine, by calculation, the greatest height of attained.
- **(e)** Determine, by calculation, the range of the projectile.
- **(f)** Graph the path of the projectile in each case.
- **(g)** From your graph, determine the greatest height attained in each case.
- **(h)** From your graph, determine the range of the projectile in each case.
- **(i)** Discuss the significance of your answers.

2 Repeat question **1** with $k = 0.05$.

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3 Repeat question **1** with $k = 0.1$. Compare your answers to questions **1**, **2** and **3**.

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4 A projectile is fired at an angle of 30° to the horizontal with an initial velocity of $6\,\text{m s}^{-1}$.

(a) Write the equation of the trajectory if there is no air resistance.

(b) If air resistance is proportional to the velocity of the projectile, with $k = 0.02$, write the equation of the trajectory in both parametric form and Cartesian form.

(c) If air resistance is proportional to the square of the velocity of the projectile, with $k = 0.02$, write the equation of the trajectory in parametric form and Cartesian form.

(d) Graph the path of the projectile in each case.

(e) From your graph, determine the greatest height attained in each case.

(f) From your graph, determine the range of the projectile in each case.

(g) Discuss the significance of your answers.

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