

Math 80B Take home assignment Application Problems Due Monday March 16, 2009

Name If you worked with others, list their names here:.....

1. The Segway PT is a two-wheeled, self-balancing electric vehicle invented by Dean Kamen. It is produced by Segway Inc. of New Hampshire, USA. (see photos below)



A Segway can travel at speeds up to 12.5 mph, depending on the settings you choose. The Segway needs a certain turning radius to turn safely.

The speed of the Segway and its turning radius are related by the following formula:

$$v(r) = \sqrt{4.6r} \quad \text{where } v \text{ is the velocity in miles per hour and } r \text{ is the minimum turning radius in feet.}$$

Use the formula given to answer questions a), b) and c): **Show how you obtained your answers.** Use **complete sentences**.

a) At what top speed can you safely turn if the turning radius is 10.65 feet?

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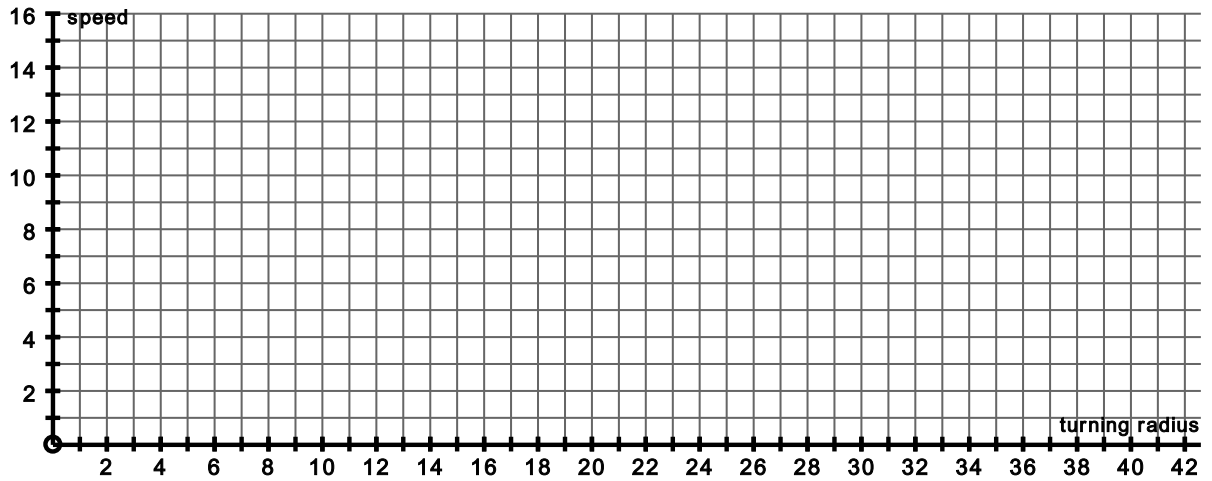
b) At what top speed can you safely turn if the turning radius is 3.5 feet?

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c) What turning radius must be available to turn at 6 mph?

d) Sketch the graph of $v(r) = \sqrt{4.6r}$ on the axes below by completing this table and plotting the corresponding points on the grid:

Turning radius	Speed
0	
4	
8	
10.65	
14	
18	
22	
26	



e) Are your answers to questions a), b) and c) confirmed by your graph? Explain.

f) Interpret the point (8, 6) in context. (This means you need to write a sentence explaining what the 8 and 6 represent in relation to the Segway.) Use complete sentences and include units.

- g) Using **only the graph**, (do not use the formula), at approximately what speed will the turning radius be 16 feet? Mark this point on the graph, label it “g”.
- h) Using **only the graph**, (do not use the formula) what turning radius must be available at 20 mph? Mark this point on the graph, label it “h”.
- i) Explain why even though the point (40, 13.5) appears on the graph, it does not have a meaning in the context of this problem situation.

j) Solve $v = \sqrt{4.6r}$ for r .

- k) Use your answer to j) to find the speed for which the available turning radius must be 12 feet. Round your answer to the nearest tenth. Is your answer confirmed by the graph? Explain.

2. The total number of people, in thousands, age 65 years old and over who were below the poverty level can be modeled by

$$N(t) = -59(t - 12)^2 + 3890$$

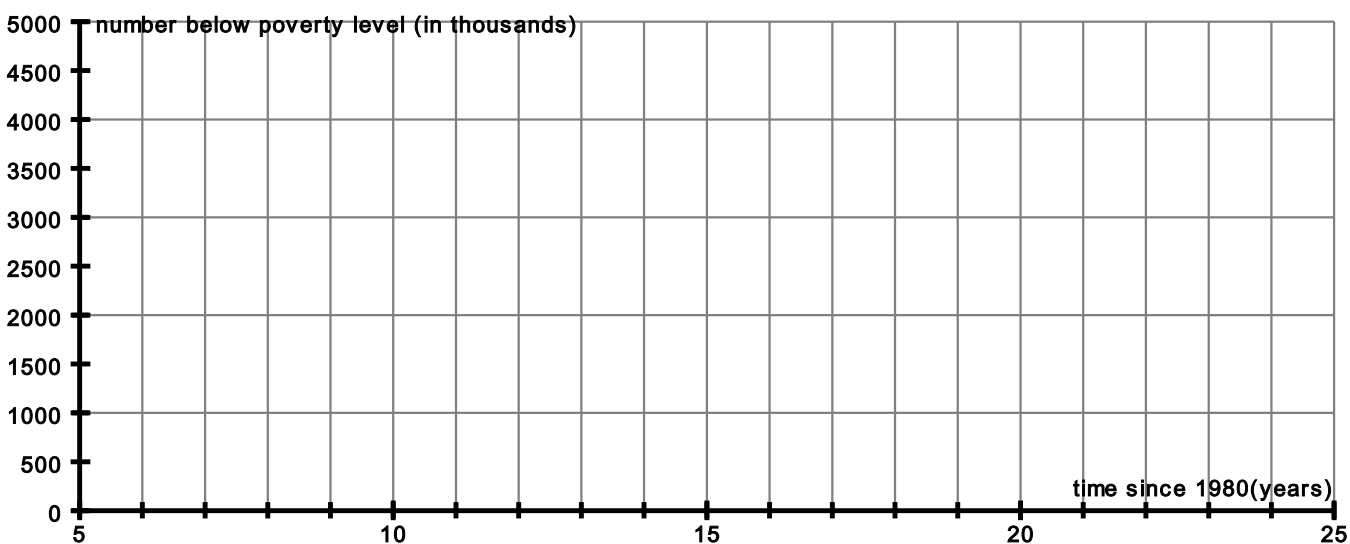
Where $N(t)$ represents the total number of people 65 years and over in the U.S. who were below the poverty level, **in thousands**, t years from 1980.

Use the model to answer the questions below:

a) In 1992, how people 65 years and over in the U.S. were living below the poverty level? Use a complete sentence to answer the question. (Hint, 1980 corresponds to $t = 0$)

b) How many people 65 years and over in the U.S. were below the poverty level in 2000? (Hint: find the value of t for the year 2000)

c) Use your graphing calculator to sketch the graph of $N(t)$ on the grid below:



d) Explain the point (15, 3359) in the context of this problem.

e) Use the features on your graphing calculator to determine in what year the most people over 65 years old were below the poverty level. Mark this point on the graph, label it "e". How many people over 65 years were below the poverty level at that time? (Hint, you will need to use the Maximum feature on your graphing calculator).

f) Use the graph above to find the year(s) when there were about 2,500, 000 people age 65 or older below the poverty level. Mark this point on the graph, label it "f".