**What Makes a Function Linear?**

**Linear functions** have graphs that are straight lines while **nonlinear functions** have graphs that are NOT straight lines. If a graph is made up of two or more pieces of lines, then that graph is a special type of linear function called a **piecewise linear function**.

1. Determine which graphs are linear and which graphs are nonlinear.

A B



C D



**Distance-time functions** describe the distance between a person and an object over time. A distance-time function may be linear or non-linear, increasing, decreasing, or constant, depending on the type of movement. To describe a distance-time function, tell (a)where the object starts, (b)what direction it moves, (c)how fast it moves and (d)whether it is speeding up, slowing down or moving at a steady rate.

1. Suppose a person’s distance from a motion detector is changing over time.
2. Identify the independent variable in this situation.
3. Identify the dependent variable in this situation.

We will now create graphs of distance-time functions to match descriptions of movements. The graphs should show a person’s distance from a motion detector sensor over time.

1. Sketch the distance-time graphs for the following scenarios.

|  |  |
| --- | --- |
| 1. Stand one meter from the sensor, walk at a constant (steady) slow pace away from the sensor.      1. Stand one meter from the sensor, and as you walk away, change your pace from fast to slow. | 1. Stand one meter from the sensor, walk away from the sensor changing your pace from slow to fast.      1. Stand five meters from the sensor and walk toward the sensor at a constant rate. |

|  |  |
| --- | --- |
| 1. Stand five meters from the sensor and walk towards the sensor slowly at first, then speed up.      1. Stand one meter from the sensor and stand still the whole time. | 1. Stand five meters from the sensor and walk toward the sensor quickly at first, then slow down.      1. Stand one meter from the sensor and stand still for 3 seconds, then walk away at a constant rate. |

1. a. Describe any similarities among the graphs in 3a, 3b and 3c.
2. What are differences between the graph 3a and the graphs 3b and 3c?
3. Which of the graphs in question (3) could be considered *linear* and which are *nonlinear*?

Linear: Nonlinear:

1. Describe a scenario of someone walking/running that could create the graphs below.

A B

 

A: B:

1. Describe a motion that creates a linear function.
2. Describe a motion that creates a non-linear function.
3. The following table has values collected from measuring a person who attempted to walk at a constant rate. Use the data to determine whether or not the person was successful. Support your answer with a graph.

|  |  |
| --- | --- |
| **Time**  **(# of seconds)** | **Distance**  **(# of feet)** |
| 1 | 3.0 |
| 2 | 4.1 |
| 3 | 5.1 |
| 4 | 6.2 |
| 5 | 7.1 |
| 6 | 8.1 |

