1. Below are four graphs. Which graph best matches each of the following stories?

Write 1-3 sentences explaining how you know. Write a story for the graph you do not match to a story.

**Story 1**: Paul works at the Robin Cafe. On Monday he had to work the breakfast, lunch, and dinner shifts. Between each shift, he walked home to take a nap. After the dinner shift he walked back home for the night.

Graph 1 / Graph 2 / Graph 3 / Graph 4 (circle one). Write your explanation below:

**Story 2**: Things went fine until my bike had a flat tire. After fixing the tire I continued biking.

Graph 1 / Graph 2 / Graph 3 / Graph 4 (circle one). Write your explanation below:

**Story 3**: I jogged to the coffee shop and then stayed and studied there for several hours.

Graph 1 / Graph 2 / Graph 3 / Graph 4 (circle one). Write your explanation below:

**Story for unmatched graph:**
2. Consider the following mathematical statements. Determine any \( x \)-values for which the statements hold true and false. If you identify at least one \( x \)-value for which the statement is false, then you have found a counterexample. If a counterexample exists, then the statement is not true.

(a) \( \sqrt{x^2 + 4} = x + 2 \)

\begin{tabular}{|l|}
\hline
\( x \)-value(s) for which the equation holds: \\
\hline
\( x \)-value(s) for which the equation does not hold: \\
\hline
\end{tabular}

Based on your work above, is \( \sqrt{x^2 + 4} = x + 2 \) a true statement? Yes / No (circle one).

(b) \( (x + 1)^2 = x^2 + 1 \)

\begin{tabular}{|l|}
\hline
\( x \)-value(s) for which the equation holds: \\
\hline
\( x \)-value(s) for which the equation does not hold: \\
\hline
\end{tabular}

Based on your work above, is \( (x + 1)^2 = x^2 + 1 \) a true statement? Yes / No (circle one).
3. The diagram below represents a tape recorder just as it is beginning to play a tape. The tape passes from the “head” (labeled H) at a constant speed and the tape is wound from the left-hand spool on to the right hand spool. At the beginning, the radius of the tape and the left-hand spool is 2.5cm. The tape lasts 45 minutes.

(a) Sketch a graph to show how the length of the tape on the left-hand spool changes with time (label your graph as appropriate).

(b) Sketch a graph to show how the radius of the tape and the left-hand spool changes with time (label your graph as appropriate).

(c) Describe (with words) how the radius of the tape and the right-hand spool changes with time. Explain why it changes this way.
4. Simplify the following expression. Be sure to show all work. An answer with no supporting work will not receive credit.

\[
\frac{x^2 - 1}{2x^3 - 8x^2 - 10x}
\]