1. Question Details

Each figure below shows \( \sin(x) \) together with a constant Taylor polynomial. Each Taylor polynomial has a different center point. Which one seems to provide the best approximation to \( \sin(x) \)?

Which of the following statements best describes why one approximation is better than the others?

- At the center point, the value of \( \sin(x) \) is zero.
- At the center point, the slope of \( \sin(x) \) is steep.
- At the center point, the slope of \( \sin(x) \) is zero.

2. Question Details

Each figure below shows a function, \( f(x) \), together with a constant Taylor polynomial. Each Taylor polynomial has a different center point. Which one seems to provide the best approximation to \( f(x) \)?

Which of the following features of \( f(x) \) causes one approximation to better than the others?

- At the center point, the slope of \( f(x) \) is not very steep.
- At the center point, the slope of \( f(x) \) is zero.
- At the center point, the function crosses the \( y \)-axis.
The graph of \( f(x) = 9xe^{-3x} \) is shown below.

Suppose that you have to replace \( f \) with a constant Taylor polynomial, but you can choose any center point. You want the best possible approximation of \( f \), at least near the center point. What center point should you choose? Give an exact answer. No decimals.

\[ x = \]
Let \( f \) be a function such that 
\[
f(2) = -5, \quad f'(2) = 5, \quad f''(2) = 7, \quad \text{and} \quad f'''(2) = 4.
\]
For each of the graphs below, write the formula of the approximation given by the green curve using the correct form from the following list:
\[
T_0(x) = a_0 \\
T_1(x) = a_0 + a_1(x - 2) \\
T_2(x) = a_0 + a_1(x - 2) + a_2(x - 2)^2 \\
T_3(x) = a_0 + a_1(x - 2) + a_2(x - 2)^2 + a_3(x - 2)^3
\]