1. 6 points Give that \( f(x) = \sqrt{x}(x-1) \), find the equation of the tangent line to \( f \) at the point where \( x = 1 \).

The following limit must be used:

\[
\lim_{x \to 1} \frac{f(x) - f(1)}{x - 1},
\]

will give you the slope of the tangent line to \( f(x) \) at \( x = 1 \).

**Solution:**

\[
\lim_{x \to 1} \frac{f(x) - f(1)}{x - 1} = \lim_{x \to 1} \frac{\sqrt{x}(x-1) - 0}{x - 1} = \lim_{x \to 1} \sqrt{x} = 1
\]

The equation of the tangent line to \( f \) at the point where \( x = 1 \) is:

\[
y = x - 1
\]

as is clearly indicated on the graph.

2. 4 points Use a table—*I don’t need to see your table though*—of values to estimate (4 decimal places) the value of the given limit.

\[
\lim_{x \to 0} \frac{9^x - 5^x}{x}
\]
Solution: Tables may vary, but your table should produce the following.

\[
\lim_{x \to 0} \frac{9^x - 5^x}{x} \approx 0.5878
\]

If you’re interested, the exact limit is

\[
\lim_{x \to 0} \frac{9^x - 5^x}{x} = \ln 9 - \ln 5 = \ln \frac{9}{5},
\]

and we’ll learn how to do this a a later date.

Although, not asked for,a graph can be helpful.

Figure 2: Partial graph of \( y = \frac{9^x - 5^x}{x} \).