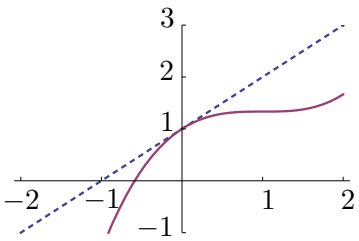
1. [10 points] Suppose that the first and third degree Taylor polynomials, $P_1(x)$ and $P_3(x)$, approximating a function $g(x)$ at $a = 0$ are given in the graph to the right, below.



a. [6 points] Using these Taylor polynomials, what are $g(0)$ and $g'(0)$? What is the sign of $g''(0)$?

Solution: We know $g(0) = 1$, and from $P_1(x)$, $g'(0) = 1$. Then $P_3(x)$ appears to be concave down, so we know that $g''(0) < 0$. We cannot, however, determine a value for $g''(0)$.

b. [4 points] Could $g(x)$ be the function $1 + \sin(x)$? Why or why not?

Solution: For this $g(x)$ we know $g(0) = 1$, $g'(0) = \cos(0) = 1$ and $g''(0) = -\sin(0) = 0$. While the first two of these are consistent with our observations in (a), the last is not, so $g(x)$ could not be the function $1 + \sin(x)$.