Let $f(x) = \cos(x)$ and let $x_0 = \frac{\pi}{2}$.

1. Find $P_3(x)$

2. Verify your answer by graphing $P_3(x)$ and $f(x)$ on the same set of axes with $-\pi \leq x \leq 2\pi$

3. Use $P_3(2)$ to approximate $\cos(2)$

4. How accurate is your answer?

5. Find a value of n so that $P_n(2)$ approximates $\cos(2)$ accurate within 10^{-10}.