1. Let $f(x) = \sin(x)$ and let $P_k(x)$ be the kth order Taylor polynomial for $f(x)$ at $x_0 = 0$.

   (a) Find $P_1(x)$, $P_2(x)$, $P_3(x)$, $P_4(x)$ and $P_5(x)$.

   (b) Verify your answers by graphing the polynomials and $f(x)$ on the same set of axes.

   (c) Use $P_5(x)$ to find an approximation for $\sin(3)$. Will this be larger or smaller than the actual value of $\sin(3)$?

   (d) Now find $P_{20}(x)$.
   Hint: You don't actually need to take all of the derivatives - notice patterns!.

2. Let $f(x) = \ln(x)$. Find $P_4(x)$, the 4th order Taylor polynomial for $f(x)$ based at $x_0 = 1$. Verify your answer by graphing $f(x)$ and $P_4(x)$ on the same set of axes. Then use $P_4(x)$ to find an approximation for $\ln(1.5)$. Compare this to the approximation of $\ln(2)$ given by Maple.

1. Let $f(x) = 14\sin(3x) + 2x^2 - 4x^3$.

   (a) Use the IVT to show that $f(x)$ has a root between $x = -2$ and $x = 2$.

   (b) Use the IVT to show that $f(x)$ has a stationary point between $x = -1$ and $x = 0$.

2. Let $f(x) = \dfrac{1}{x-2}$.

   (a) Use the IVT to show that $f(x)$ has a root between $x = 1$ and $x = 3$.

   (b) Find the exact value of the root by solving $f(x) = 0$. What goes wrong?

   (c) Reconcile your answers to parts (a) and (b).