For full credit you must present a clearly organized solution, showing all supporting calculations.

1. Use continuity and the limit laws to evaluate the limit $\lim\limits_{x \to 0} \cos\left(\dfrac{\pi}{2x} - \dfrac{\pi}{x(x+2)} \right)$. You must show all steps for full credit.

2. Show that the polynomial $p(x) = x^5 + x^3 - 2x + 1$ has a real root. (You do not need to find the root, but must carefully justify its existence.)