Q5: We first claim that for all $k \geq 0$, $f_n \to 0$. Let $\varepsilon > 0$, then for any x, take $N > \frac{|x^k|-\varepsilon|x^2|}{\varepsilon}$. Then, if we take $n \geq N$, we see that $|f_n(x)| < \varepsilon$. Now notice if $f_n \rightrightarrows f$, then $f_n \to f$ as well. By uniqueness of limits, if sequence is uniformly convergent it must converge to 0. We claim that only for $k = 0, 1$ the sequence $f_n(x) = \frac{x^k}{x^2+1}$ converges uniformly. For $k = 1$, take $N = \frac{1}{\varepsilon}$. Then if $n \geq N$, then we have that $|\frac{1}{x^2+n}| < \varepsilon$. For $k = 1$, Take $N > \max\{\frac{\varepsilon}{x} - x^2\}$. Then if $n > N$, $n > \frac{x}{\varepsilon} - x^2$, we have that $\frac{x}{x^2+n} < \varepsilon$. However, if $k > 2$, we would need $\frac{x^k}{\varepsilon} - x^2 < n$ to hold for all x, for any given n sufficiently large. We see from properties of polynomials that this will not happen. We now claim that on any bounded subset of $\mathbb{R}$, for any k, f_n converges. Without loss of generality, assume that $0 < x < M$. Then $f_n(x) = \frac{x^k}{x^2+n} < \frac{M^k}{n}$. If we take n sufficiently large we can make this as small as we desire. Hence f_n uniformly converges to 0.