1. a) Define what the notation $f(x) = o(g(x))$ as $x \to a$ means.

b) Prove that $\dfrac{1}{1 + g(x)} = 1 - g(x) + o(g(x))$, if $\lim\limits_{x \to a} g(x) = 0$.

2. a) Show that for any constant c, $\dfrac{\log(1 + cx^2 + o(x^2))}{x^2} = c + o(1)$.

b) Show that $\displaystyle\lim_{x \to 0} (\cos(x))^{a/x^2} = 1/\sqrt{e^a}$.

(Hint: write $\cos(x)^{a/x^2} = \exp[a \log(\cos(x))/x^2]$ and use part a) on $\log(\cos(x))$.)