Determine the horizontal asymptotes of the following (if any):

1. $f(x) = \dfrac{x^4 - x^2 + 2}{3x^4 + x^2 + 5}$
2. $f(x) = \dfrac{2x^5 - 2x^3 + 18}{x^4 + x^2 - x + 2}$
3. $f(x) = \dfrac{2x^5 - 2x^3 + 18}{x^4 + 3x^3 - x + 2} - 2x$
4. $f(x) = \sin(x)$
5. $f(x) = \dfrac{\cos(x)}{\ln(\ln(x))}$

Find the limit:

1. $\lim\limits_{x\to\infty} \tan^{-1}(x^2 + \sin(x) + e^{\sqrt{x}})$
2. $\lim\limits_{x\to\infty} (\mathrm{e}^{-x} + 2\cos(3x))$
3. $\lim\limits_{x\to-\infty} (\sqrt{x^2 + x + 1} + x)$

   Hint for the last one: Here is the graph of the function- See if you can justify the numbers that you see.