1. $f(g(x)) = f(1-x) = (1-x)^2 + 1 = x^2 - 2x + 2$

$g(f(x)) = g(x^2+1) = 1 - (x^2+1) = -x^2$

2.
а) $\lim\limits_{x\to\infty} \dfrac{2x+1}{3x^2+2x-7} = \lim\limits_{x\to\infty} \dfrac{\frac{2x}{x^2}+\frac{1}{x^2}}{3+\frac{2x}{x^2}-\frac{7}{x^2}} =$

$= \dfrac{0}{3} = 0$

в) $\lim\limits_{x\to-2} \dfrac{x^2-x-6}{x^2+3x+2} = \lim\limits_{x\to-2} \dfrac{(x-3)(x+2)}{(x+1)(x+2)} =$

$= \lim\limits_{x\to-2} \dfrac{x-3}{x+1} = \dfrac{-5}{-1} = 5$

3. $f(x) = \dfrac{8x}{1+x^2}$

$f'(x) = \dfrac{8(1+x^2) - 8x\cdot 2x}{(1+x^2)^2} = \dfrac{-8(x^2-1)}{(1+x^2)^2}$

$f''(x) = \dfrac{-16x(1+x^2)^2 + 8(x^2-1)\cdot 2(1+x^2)\cdot 2x}{(1+x^2)^4} =$

$= \dfrac{(1+x^2)(-16x - 16x^3 + 32x^3 - 32x)}{(1+x^2)^4} =$

$= \dfrac{16x^3 - 48x}{(1+x^2)^3} = \dfrac{16x(x^2-3)}{(1+x^2)^3} = 0$

$-\quad +\quad -\quad +$

$-\sqrt{3}\quad 0\quad \sqrt{3}\quad x$