MAT 131 sample problems for test 1

The following problems are a bit challenging, this is not homework.

1.Find domain for the following functions:

1) $f(x) = \sqrt{-x^2 + 3x - 2}$;

2) $g(x) = \ln \sqrt[3]{2^x - 1}$;

3) $f(t) = \sqrt{9 - t^2} - \sqrt{t^2 - 4}$;

4) $g(x) = \ln(\sin x)$ (consider first for the interval [0,2π]).

2.Find the inverse function for the following functions(and think about why the inverse function exist):

1) $f(x) = \ln(1 + \ln(1 + x))$;

2) $f(x) = \sin(x^3 + 1)$, $x \in (0, \frac{1}{2})$;

3) $f(x) = 2^{\ln x + 1}$;

4) $f(x) = \begin{cases} x & x > \pi/2 \\ \sin x & x \in [-\pi/2, \pi/2] \\ 2x - 7 & x < -\pi/2 \end{cases}$

3.Find the limit:

1)

$$\lim_{x \to 1} \frac{x^2 - x}{x^3 - x}$$

2)

$$\lim_{x \to\ 2} \frac{x^2 - x - 2}{x - 2}$$

4. draw the graph of the following functions:

1)$f(x) = |x + 1|$;

2)$f(x) = |x^2 - 4x + 3|$;

3)$f(x) = \frac{|x^2 - x|}{|x|}$;

5 If $f(x) = x + \ln x + \sin x + \tan x$, $x \in (0, \pi/2)$;

a)show that $f(x)$ has an inverse function;(Hint:consider the monotonicity of the function)

b)compute $f^{-1}(1) + \ln(f^{-1}(1)) + \sin(f^{-1}(1)) + \tan(f^{-1}(1))$;