Problem 1. Evaluate the following limits:

1. $\lim_{x\to 2} \dfrac{x^2-6}{x+2}$.
2. $\lim_{x\to 1/2} \dfrac{4x^2-4x+1}{2x-1}$.
3. $\lim_{x\to 3} \dfrac{x^2-x-6}{x-3}$.
4. $\lim_{x\to 2^-} \sqrt{4-2x}$.
5. $\lim_{t\to\infty} \dfrac{t-3t^2}{7-2t-9t^2}$.
6. $\lim_{x\to\infty} \left(\sqrt{x^2+4}-x\right)$. Hint: multiply by $\dfrac{\sqrt{x^2+4}+x}{\sqrt{x^2+4}+x}$.

Problem 2. Let $f(x) = \begin{cases} x & x<1 \\ 2 & x\geq 1 \end{cases}$. Show that f is discontinuous at $x=1$.

Problem 3. Use the four step process (that is using the definition of the derivative) to find derivatives of the following functions.

1. $f(x) = 2-3x$.
2. $f(x) = x^2$.
3. $f(x) = \dfrac{1}{x}$.
4. $f(x) = \dfrac{1}{x^2}$.
5. $f(x) = \sqrt{1-x}$.

Answers to Problem 1. (1) $-1/2$, (2) 0 , (3) 5 , (4) 0 , (5) $1/3$, (6) 0 .

Answer to Problem 2. Left hand limit is 1 while right hand limit is 2.

Answers to Problem 3. (1) -3 , (2) $2x$, (3) $\dfrac{-1}{x^2}$, (4) $\dfrac{-2}{x^3}$, (5) $\dfrac{-1}{2\sqrt{1-x}}$.