Mathematics Preparatory Course - MSc in EEBL

Real-valued function I

Exercises

1. Determine whether these functions are odd or even

   - $f(x) = x^2 - 3$
   - $f(x) = 3x^3$
   - $f(x) = \frac{x^2}{x^4+1}$
   - $f(x) = \frac{x^3}{x^{1/3}+x}$
   - $f(x) = \ln(x^4 - 1)$
   - $f(x) = \frac{1}{e^x - e - x}$
   - $f(x) = |x - 2| + 4$

2. Determine the domain of these functions

   - $f(x) \frac{x}{x^3-1}$
   - $f(x) = \frac{2x+1}{x^2-5x+6}$
   - $f(x) = \frac{x^2}{|x+4|}$
   - $f(x) = \sqrt{3 - x^2}$
   - $f(x) = e^{\frac{x-1}{2}}$
   - $f(x) = \sqrt{\ln x}$
   - $f(x) = \ln(\frac{x+2}{x-3})$

3. find the limit of the following function

   - $\lim_{x\to 0} \frac{x-3}{x^2}$
   - $\lim_{x\to 2} e^{\frac{1}{x-3}}$
   - $\lim_{x\to -1} 3^{\frac{1}{(x+1)^2}}$
   - $\lim_{x\to +\infty} \frac{x^2+1}{x^2+2x^3}$
   - $\lim_{x\to -\infty} \ln \frac{1+x}{x}$
   - $\lim_{x\to -\infty} \frac{x^2+x^3}{x^2+x-2}$
   - $\lim_{x\to 1} \frac{x^2-x}{x^2+x-2}$

4. Find the derivative of the following functions

   - $f(x) = e^x + \sqrt{x}$
   - $f(x) = \ln(x) + 2x^3$
   - $f(x) = x^{\frac{1}{3}}(x^2 - 2x + 4)$
   - $f(x) = \ln x(1 - 3x^2)$
   - $f(x) = (e^x + 5x)^3$
   - $f(x) = \frac{x^3+x}{x^2}$
   - $f(x) = \frac{e^x}{x} + \ln x$
   - $f(x) = \frac{2x+3\sqrt{x}}{e^x+x}$

5. Find the stationary points of the following functions

   - $f(x) = x^3 - 3x$
   - $f(x) = \frac{2}{x-3}$
   - $f(x) = x \ln x$
   - $f(x) = \ln(\sqrt{x} - x)$