45. Find the following limits provided they exist:

(a) $\lim_{x\to 0, x>0} \frac{x+\sqrt{x}}{2+\sqrt{x}}$, $\lim_{x\to 0} \frac{1}{x}$, $\lim_{x\to -2} \frac{|x+2|}{x+2}$, $\lim_{x\to 0} \frac{1+\frac{1}{x}}{1+\frac{1}{x^2}}$;

(b) $\lim_{x\to\infty} \left(\sqrt{(x+a)(x+b)} - x\right)$ $(a, b \in \mathbb{R})$;

(c) $\lim_{x\to 1} \frac{\sqrt{x}-1}{x-1}$, $\lim_{x\to x_0} \frac{\sqrt{x}-\sqrt{x_0}}{x-x_0}$ $(x_0 > 0)$;

(d) $\lim_{x\to 1} \frac{x^4-1}{x-1}$, $\lim_{x\to 1} \frac{x^{-4}-1}{x-1}$, $\lim_{x\to x_0} \frac{x^n-x_0^n}{x-x_0}$ $(x_0 \in \mathbb{R}, n \in \mathbb{Z})$;

(e) $\lim_{x\to 0} \frac{e(x)-1}{x}$, $\lim_{x\to x_0} \frac{e(x)-e(x_0)}{x-x_0}$ $(x_0 \in \mathbb{R})$;

(f) $\lim_{x\to 1} \frac{l(x)}{x-1}$, $\lim_{x\to x_0} \frac{l(x)-l(x_0)}{x-x_0}$ $(x_0 > 0)$;

(g) $\lim_{x\to 0} \frac{A(a,x)-1}{x}$, $\lim_{x\to x_0} \frac{A(a,x)-A(a,x_0)}{x-x_0}$ $(x_0 \in \mathbb{R}, a > 0)$.

46. Find (if differentiable) the derivatives of the following functions:

(a) $f(x) = x^4 + 5x^2$;

(b) $f(x) = \frac{x^2-2x+1}{x-2}$;

(c) $f(x) = \sqrt{x^2+\sqrt{x}}$;

(d) $f(x) = \frac{x^2}{\sqrt{x^2+1}+1}$;

(e) $f(x) = (x^3-1)^8(3x^2+5x)^7$;

(f) $f(x) = e(x^2 + l(\sqrt{x}))$;

(g) $f(x) = |x|x$;

(h) $f(x) = A(x, x)$.

47. Find all triples (a, b, c) such that $f(x) = \begin{cases} ax^2+b & \text{for} \quad x \le 1 \\ cx^4 - 2x^2 & \text{for} \quad x > 1 \end{cases}$

is differentiable at 1.

48. Let $C(x) = \frac{1}{2}(e(x) + e(-x))$ and $S(x) = \frac{1}{2}(e(x) - e(-x))$, $x \in \mathbb{R}$. Calculate $C^2 - S^2$, C', S', and (if C and S are invertible) $(C^{-1})'$ and $(S^{-1})'$.

49. Is $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = \begin{cases} e\left(-\frac{1}{x^2}\right) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$ differentiable at 0?

50. Suppose $f : \mathbb{R} \to \mathbb{R}$ is differentiable and odd. Show that $f' : \mathbb{R} \to \mathbb{R}$ is even.