Zderivujte následující funkce. Nadto určete jejich definiční obor i definiční obor jejich derivací. Pokud je to možné, derivace zjednodušte.

(i) $\sqrt{x^3+1}$

(ii) $x^2\mathrm{e}^x\cos x$

(iii) $\arccos\dfrac{2x-1}{\sqrt{3}}$

(iv) $\ln\ln\sin x$

(v) $(x^2+1)^{\cos(\pi x)}$

(vi) $\arcsin\sqrt{\dfrac{1-x}{1+x}}$

(vii) $\ln^2 x$

(viii) $\ln x^2$

(ix) $\ln(2x)$

(x) $(2+3x^2)^5$

(xi) $\dfrac{\sin x}{1+\cos x}-\dfrac{\sin 3}{\sin 4}$

(xii) $\ln\dfrac{1-\mathrm{e}^{-2x}}{1+\mathrm{e}^{-2x}}$

(xiii) $2x\sqrt{x-4x^2}$

(xiv) $2x-(1-x^2)\ln\dfrac{1+x}{1-x}$

(xv) $\sqrt{x-x^2}+(2x-1)\arcsin\sqrt{x}+\operatorname{arctg}\sqrt{5}$

(xvi) $\ln|x|$

(xvii) $\sqrt{x^4-1}+\sqrt{2}$

(xviii) $\sqrt[4]{\sin(4x)}$

(xix) $\dfrac{1}{\log x}$

(xx) $\operatorname{arccotg}\dfrac{2x}{x^2-1}$

Výsledky $\big(f',\ \mathcal{D}(f),\ \mathcal{D}(f')\big)$

(i) $\dfrac{3x^2}{2\sqrt{x^3+1}},\ [-1,+\infty),\ (-1,+\infty)$; (ii) $\mathrm{e}^x(2x\cos x+x^2\cos x-x^2\sin x),\ \mathbb{R},\ \mathbb{R}$;

(iii) $-\dfrac{\sqrt{2}}{\sqrt{1+2x-2x^2}},\ \left[\dfrac{1-\sqrt{3}}{2},\dfrac{1+\sqrt{3}}{2}\right],\ \left(\dfrac{1-\sqrt{3}}{2},\dfrac{1+\sqrt{3}}{2}\right)$; (iv) $\mathcal{D}(f)=\emptyset$;

(v) $(x^2+1)^{\cos(\pi x)}\left(-\pi\sin(\pi x)\ln(x^2+1)+\cos(\pi x)\dfrac{2x}{x^2+1}\right),\ \mathbb{R},\ \mathbb{R}$;

(vi) $-\dfrac{1}{(1+x)\sqrt{2x(1-x)}},\ [0,1],\ (0,1)$; (vii) $2\dfrac{\ln x}{x},\ (0,+\infty),\ (0,+\infty)$;

(viii) $\dfrac{2}{x},\ \mathbb{R}\setminus\{0\},\ \mathbb{R}\setminus\{0\}$; (ix) $\dfrac{1}{x},\ (0,+\infty),\ (0,+\infty)$; (x) $30x(2+3x^2)^4,\ \mathbb{R},\ \mathbb{R}$;

(xi) $\dfrac{1}{1+\cos x},\ \mathbb{R}\setminus\big\{(2k+1)\pi,\ k\in\mathbb{Z}\big\},\ \mathbb{R}\setminus\big\{(2k+1)\pi,\ k\in\mathbb{Z}\big\}$; (xii) $\dfrac{4\mathrm{e}^{2x}}{\mathrm{e}^{4x}-1},\ (0,+\infty)$,
$(0,+\infty)$; (xiii) $\dfrac{x(3-16x)}{\sqrt{x(1-4x)}},\ [0,1/4],\ (0,1/4)$; (xiv) $2x\ln\dfrac{1+x}{1-x},\ (-1,1),\ (-1,1)$;

(xv) $2\arcsin\sqrt{x},\ [0,1],\ (0,1)$; (xvi) $\dfrac{1}{x}\ \ \mathbb{R}\setminus\{0\},\ \mathbb{R}\setminus\{0\}$; (xvii) $2\dfrac{x^3}{\sqrt{x^4-1}}$,

$(-\infty,-1]\cup[1,+\infty),\ (-\infty,-1)\cup(1,+\infty)$; (xviii) $\dfrac{\cos(4x)}{\sqrt[4]{\sin^3(4x)}}$,

$\left\{\left[k\dfrac{\pi}{2},\dfrac{\pi}{4}+k\dfrac{\pi}{2}\right],\ k\in\mathbb{Z}\right\},\ \left\{\left(k\dfrac{\pi}{2},\dfrac{\pi}{4}+k\dfrac{\pi}{2}\right),\ k\in\mathbb{Z}\right\}$; (xix) $-\dfrac{1}{x\log^2 x\ln 10}$,

$(0,+\infty)\setminus\{1\},\ (0,+\infty)\setminus\{1\}$; (xx) $\dfrac{2}{1+x^2},\ \mathbb{R}\setminus\{\pm1\},\ \mathbb{R}\setminus\{\pm1\}$