1) $f(x)=2\cdot\arcsin\sqrt{\frac{x}{2}}-\sqrt{2x-x^2}$

$$f'(x)=2\cdot\frac{1}{\sqrt{1-\frac{x}{2}}}\cdot\frac{1}{2\sqrt{\frac{x}{2}}}\cdot\frac{1}{2}-\frac{1}{2}\cdot\frac{1}{\sqrt{2x-x^2}}\cdot(2-2x)=$$

$$=\frac{1}{2}\cdot\frac{1}{\sqrt{\frac{x}{2}(1-\frac{x}{2})}}-\frac{2(1-x)}{2\sqrt{2x-x^2}}=\frac{1}{2\sqrt{\frac{1}{4}(2x-x^2)}}-\frac{1-x}{\sqrt{2x-x^2}}=$$

$$=\frac{1-1+x}{\sqrt{2x-x^2}}=\frac{x}{\sqrt{2x-x^2}}=\sqrt{\frac{x^2}{2x-x^2}}=\underline{\underline{\sqrt{\frac{x}{2-x}}}}$$

2) $f(x)=x\cdot\arcsin\sqrt{\frac{x}{x+1}}+\operatorname{arctg}\sqrt{x}-\sqrt{x}$

$$f'(x)=\arcsin\sqrt{\frac{x}{x+1}}+\frac{x}{\sqrt{1-(\frac{x}{x+1})}}\cdot\frac{1}{2}\cdot\frac{1}{\sqrt{\frac{x}{x+1}}}\cdot\frac{x+1-x}{(x+1)^2}+\frac{1}{x+1}\cdot\frac{1}{2}\cdot\frac{1}{\sqrt{x}}-$$

$$-\frac{1}{2\sqrt{x}}=\arcsin\sqrt{\frac{x}{x+1}}+\frac{x}{2}\cdot\sqrt{x+1}\cdot\frac{\sqrt{x+1}}{\sqrt{x}}\cdot\frac{1}{(1+x)^2}+\frac{1-(x+1)}{(x+1)2\sqrt{x}}=$$

$$=\arcsin\sqrt{\frac{x}{x+1}}+\frac{x\cdot(1+x)}{2\sqrt{x}(1+x)^2}+\frac{-x}{2\sqrt{x}(1+x)}=\underline{\underline{\arcsin\sqrt{\frac{x}{x+1}}}}$$

3) $f(x)=x\cdot e^{-x^2}$

$$f'(x)=e^{-x^2}+x\cdot e^{-x^2}(-2x)=\underline{\underline{e^{-x^2}(1-2x^2)}}$$

4) $f(x)=5^{x^2-2x+1}$

$$f'(x)=5^{x^2-2x+1}\cdot(2x-2)$$

5) $f(x)=\log_2(1-x^2)$

$$f'(x)=\frac{1}{(1-x^2)\cdot\ln 2}(-2x)$$

6) $f(x)=\ln\frac{x+1}{2-x}$

$$f'(x)=\frac{1}{\frac{x+1}{2-x}}\cdot\frac{2-x-(x+1)(-1)}{(2-x)^2}=\frac{2-x}{x+1}\cdot\frac{2-x+x+1}{(2-x)^2}=\underline{\underline{\frac{3}{(x+1)(2-x)}}}$$

DEFINIČNÍ OBORY:

1) $-1 \le \sqrt{\frac{x}{2}} \le 1 \Rightarrow D(f) = \langle 0,2 \rangle$

$x \ge 0$

$2x - x^2 \ge 0$ $\Big\}$ f': $1 - \frac{x}{2} > 0$ $\quad 2x - x^2 > 0$ $\quad D(f') = (0,2)$

$x > 0$

2) $1 + \sin x \neq 0 \Rightarrow D(f) = \mathbb{R} \setminus \left\{ \frac{3}{2}\pi + 2k\pi;\ k \in \mathbb{Z} \right\} = D(f')$

3) $D(f) = D(f') = \mathbb{R}$

4) $D(f) = D(f') = \mathbb{R}$

5) $1 - x^2 > 0 \Rightarrow D(f) = D(f') = (-1,1)$

6) $\frac{x+1}{2-x} > 0 \Rightarrow D(f) = D(f') = (-1,2)$