Inverse function

Determine $D(f)$ and $H(f)$ and type of monotonicity of to the function $y = f(x)$ and find, whether there exists an inverse function. If such function exists, determine its formula.

1. $f: y = 2 - 2x$

$D(f) = \boldsymbol{R}, H(f) = \boldsymbol{R},$ decreasing, $f^{-1}(x) = \dfrac{2-x}{2}$

2. $f(x) = x + 2\sqrt{x}$

$D(f) = H(f) = \langle 0, \infty),$ increasing, $f^{-1}(x) = (\sqrt{x+1} - 1)^2$

3. $f: y = 1 - \sqrt{2x-4}$

$D(f) = \langle 2, \infty), H(f) = (-\infty, 1\rangle,$ decreasing, $f^{-1}(x) = \dfrac{(x-1)^2}{2} + 2$

4. $f: y = \dfrac{x+1}{x-2}$

$D(f) = \boldsymbol{R} - \{2\}, H(f) = \boldsymbol{R} - \{1\},$ one-to-one, $f^{-1}(x) = \dfrac{2x+1}{x-1}$

5. $f(x) = \dfrac{\sqrt{x}}{1+\sqrt{x}}$

$D(f) = \langle 0, \infty), H(f) = \langle 0, 1),$ increasing, $f^{-1}(x) = \left(\dfrac{x}{1-x}\right)^2$

6. $f: y = 3 - \log_{\frac{1}{2}} x - 1$

$D(f) = \langle 1, \infty), H(f) = \boldsymbol{R},$ increasing, $f^{-1}(x) = 1 - \left(\dfrac{1}{2}\right)^{x-3}$

7. $f: y = 3e^{x+2}$

$D(f) = \boldsymbol{R}, H(f) = (0, \infty),$ increasing, $f^{-1}(x) = -2 + \ln\dfrac{x}{3}$

8. $f(x) = \dfrac{1}{1+e^x}$

$D(f) = \boldsymbol{R}, H(f) = (0, 1),$ decreasing, $f^{-1}(x) = \ln\dfrac{1-x}{x}$

9. $f(x) = -\ln(10^x - 1)$

$D(f) = (0, \infty), H(f) = \boldsymbol{R}),$ decreasing, $f^{-1}(x) = \log(1 + e^{-x})$

10. $f: y=-2\cot(3x+\pi)$

$$D(f)=\left(-\frac{\boldsymbol{\pi}}{3},0\right)\boldsymbol{R}, H(f)=\boldsymbol{R}, \text{decreasing } f^{-1}(x)=\frac{-arc\cot\left(-\frac{x}{2}\right)+\pi}{3}$$

11. $f: y=1+2\arcsin\ 2-x$

$$D(f)=\langle 1,3\rangle, H(f)=\langle 1-\pi,1+\pi\rangle, \text{decreasing } f^{-1}(x)=2-\sin\frac{x-1}{2}$$

12. $f: 3arc\cot\ 2x+1$

$$D(f)=\boldsymbol{R}, H(f)=(0,3\pi), \text{decreasing } f^{-1}(x)=\frac{-1+\cot g\frac{x}{3}}{2}$$

13. $f: y=-2+arctg2x$

$$D(f)=\boldsymbol{R}, H(f)=(-2-\frac{\pi}{2},-2+\frac{\pi}{2}), \text{increasing } f^{-1}(x)=\frac{tg(x+3)}{2}$$

14. $f: y=1-\arccos\frac{x+1}{3}$

$$D(f)=\langle -4,2\rangle, H(f)=(1-\pi,1), \text{increasing}, f^{-1}(x)=3\cos(1-x)-1$$

15. $f(x)=\sin(\arctan x)$

$$D(f)=R, H(f)=(-1,1), \text{increasin}g, f^{-1}(x)=\tan(\arcsin x)$$

16. $f(x)=\cos(arc\cot x)$

$$D(f)=R, H(f)=(-1,1), \text{increasin}g, f^{-1}(x)=\cot(\arccos x)$$