

## 4.8 Inverse Functions

$$f(x) = 2x + 1$$

$$g(x) = \frac{1}{2}(x-1)$$

8. False. this must be true for all values of  $x$ , not just "2"

1.  $f(g(4))$

$$g(4) = \frac{1}{2}(4-1) = \frac{3}{2}$$

$$f\left(\frac{3}{2}\right) = 2\left(\frac{3}{2}\right) + 1 = 3 + 1 = \boxed{4}$$

9.  $(1, -3)$

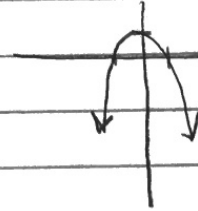
10.  $-3$

2.  $g(f(-4))$

$$f(-4) = 2(-4) + 1 = -7$$

$$g(-7) = \frac{1}{2}(-7-1) = \frac{1}{2}(-8) = \boxed{-4}$$

11.  $f(x) = 1 - x^2$



no inverse  
does not pass  
horizontal  
line test

3.  $f(g(1.5))$

$$g(1.5) = \frac{1}{2}\left(\frac{3}{2}-1\right) = \frac{1}{2}\left(\frac{1}{2}\right) = \frac{1}{4}$$

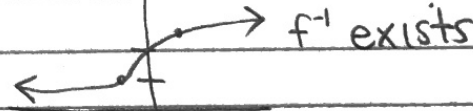
$$f\left(\frac{1}{4}\right) = 2\left(\frac{1}{4}\right) + 1 = \frac{1}{2} + 1 = \boxed{\frac{3}{2}}$$

4.  $g(f(1.5))$

$$f(1.5) = 2\left(\frac{3}{2}\right) + 1 = 3 + 1 = 4$$

$$g(4) = \frac{1}{2}(4-1) = \frac{1}{2}(3) = \boxed{\frac{3}{2}}$$

12.  $f(x) = x^3 + 2$



$$x = y^3 + 2$$

$$x - 2 = y^3$$

$$y = \sqrt[3]{x-2}$$

$$\boxed{f^{-1}(x) = \sqrt[3]{x-2}}$$

5.  $f(g(1+\sqrt{2}))$

$$g(1+\sqrt{2}) = \frac{1}{2}(1+\sqrt{2}-1) = \frac{1}{2}(\sqrt{2}) = \frac{\sqrt{2}}{2}$$

$$f\left(\frac{\sqrt{2}}{2}\right) = 2\left(\frac{\sqrt{2}}{2}\right) + 1 = \sqrt{2} + 1$$

6.  $g(f(1-\sqrt{2}))$

$$f(1-\sqrt{2}) = 2(1-\sqrt{2}) + 1 = 2 - 2\sqrt{2} + 1 = 3 - 2\sqrt{2}$$

$$g(3-2\sqrt{2}) = \frac{1}{2}(3-2\sqrt{2}-1) = \frac{1}{2}(2-2\sqrt{2}) = \boxed{1-\sqrt{2}}$$

7.  $f(g(x)) = 2\left(\frac{1}{2}(x-1)\right) + 1 = (x-1) + 1 = x$

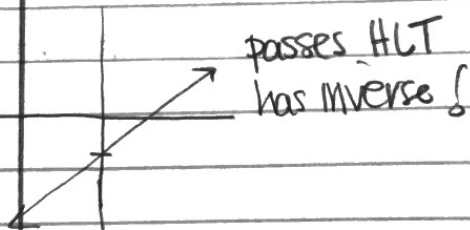
$$g(f(x)) = \frac{1}{2}(2x+1-1) = \frac{1}{2}(2x) = x$$

yes!

$$f(g(x)) = g(f(x)) = x$$

13.  $f(x) = \frac{2x-5}{3} = \frac{2}{3}x - \frac{5}{3}$

16. cops ! 😊



passes HLT  
has inverse !

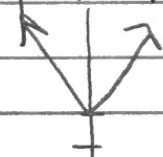
$$x = \frac{2y-5}{3}$$

$$3x = 2y - 5$$

$$3x + 5 = 2y$$

$$y = \frac{3x+5}{2}$$

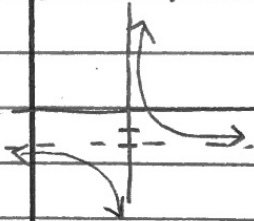
14.  $y = 2 + |x|$



no inverse

does not pass HLT

15.  $f(x) = \frac{1}{x} - 2$



$$x = \frac{1}{y} - 2$$

$$x + 2 = \frac{1}{y}$$

$$\frac{x+2}{-1} = \frac{1}{y}$$

$$\frac{-1}{x+2} = y$$

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