Solutions for Practice of Section 1.6

1. Given f(x) = 2x-1 and g(x) = x^2+3

Find

$(f+g)(x)$	$(g \circ f)(x)$
$\frac{g}{f}(x)$	$(f \circ f)(-3)$
$(fg)(2)$	$(fg)(-1) - g(2)$

a) $(f+g)(x) = f(x) + g(x) = 2x-1 + x^2+3 = x^2+2x+2$

b) $(g \circ f)(x) = g(f(x)) = g(2x-1) = (2x-1)^2+3 = 4x^2-4x+1+3 =$
$= 4x^2-4x+4$

c) $\frac{g}{f}(x) = \frac{g(x)}{f(x)} = \frac{x^2+3}{2x-1}$

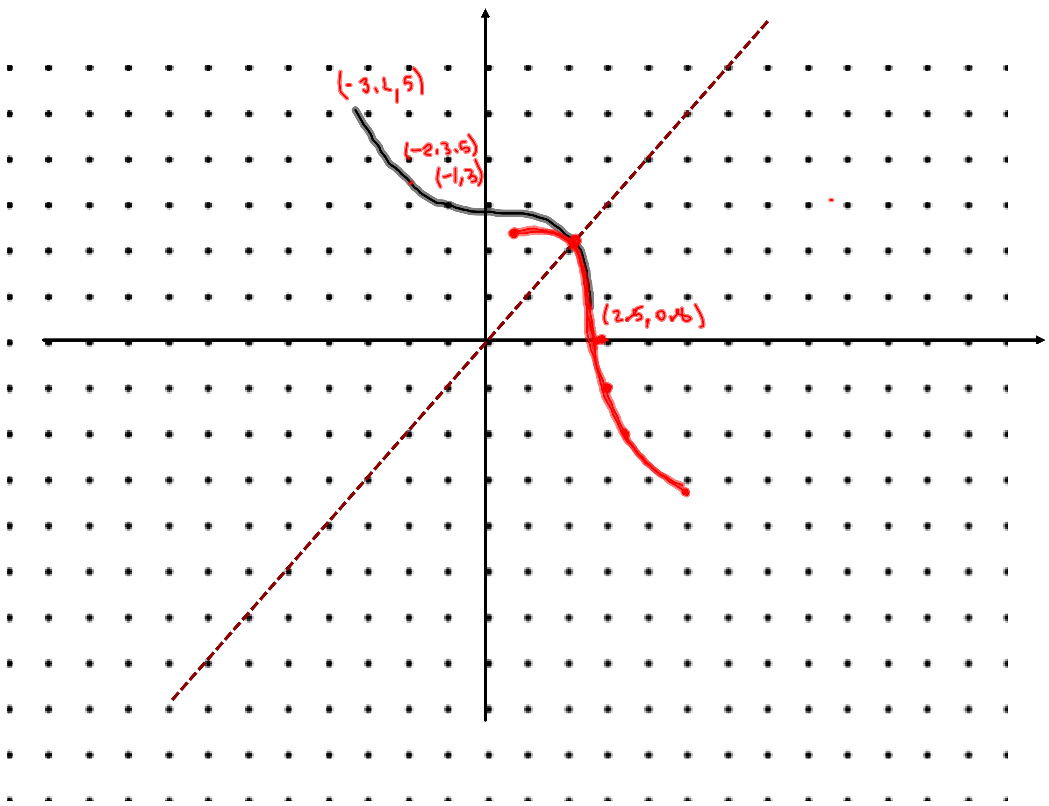
d) $(f \circ f)(x) = f(f(x)) = f(2x-1) = 2(2x-1)-1 = 4x-2-1 = 4x-3$
$\therefore (f \circ f)(-3) = 4 \cdot (-3) - 3 = -12-3 = -15$

or $(f \circ f)(-3) = f(f(-3)) = f(2 \cdot (-3)-1) = f(-7) =$
$= 2 \cdot (-7) - 1 = -15$

e) $(fg)(2) = f(2)g(2) = (2 \cdot 2 - 1)(2^2+3) = 3 \cdot 7 = 21$

f) $(fg)(-1) - g(2) = f(-1) \cdot g(-1) - g(2) =$
$= (2 \cdot (-1) - 1) \cdot ((-1)^2+3) - (2^2+3) =$
$= (-3) \cdot (4) - (7) = -12 - 7 = -19$

2. Sketch the inverse of this function



3. Determine the inverse of these functions:

a) $f(x) = \dfrac{2x}{x-1}$ b) $f(x) = 5x-2$

a) $\dfrac{2x}{x-1} = y$ $x \neq 1$

$2x = y(x-1)$

$2x = yx - y$

$2x - yx = -y$

$x(2-y) = -y$

$x = -\dfrac{y}{2-y}$ $y \neq 2$

$x = \dfrac{y}{y-2}$

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

b) $5x - 2 = y$

$5x = y+2$

$x = \dfrac{y+2}{5}$

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

4. Given f(x) = 2x-1 and g(x) = x² - 3 domain: (0,∞)

Determine $f^{-1}(3)$ $g^{-1}(-1)$

$f^{-1}(x)$: $2x-1 = y$

$2x = y+1$

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

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

Range of f: $(-1, \infty)$

Domain of f^{-1}: $(-1, \infty)$

$f^{-1}(3) = \dfrac{3+1}{2} = \dfrac{4}{2} = 2$

$g^{-1}(x)$: $x^2 - 3 = y$

$x^2 = y+3$

$x = \sqrt{y+3}$

$g^{-1}(x) = \sqrt{x+3}$

Range of g: $(-3, \infty)$

Domain of g^{-1}: $(-3, \infty)$

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