

3.5 #4, 6, 9a, b, 10, 13, 14, 17, 20, 23, 26, 30

4) (a) $(2x-1)(x^2-3x-c)$
 $2x^3 - 6x^2 - 12x - x^2 + 3x + 6$
 $2x^3 - 7x^2 - 9x + 6$

(b) $2(\frac{1}{4})^3 - 7(\frac{1}{4})^2 - 9(\frac{1}{4}) + 6$
 $\frac{1}{4} - \frac{7}{4} - \frac{9}{2} + \frac{12}{2}$
 $-\frac{6}{4} + \frac{3}{2}$
 $-\frac{3}{2} + \frac{3}{2} = 0$

(c) (a) $x^2 - 3x - 6 + x^2 - 9$
 $= 2x^2 - 3x - 15$

(b) $2x^2 - 18$

9) (a) $(f \circ g)(x) = 3(-2x-5) + 1$
 $= -6x - 14$

(b) $-6(10) - 14 = -74$

(c) $(g \circ f)(x) = -2(3x+1) - 5$
 $= -6x - 7$

(d) $-6(10) - 7 = -67$

10) (a) $1 - 2(x+1)^2 = 1 - 2(x^2 + 2x + 1)$
 $= -2x^2 - 4x - 1$

(b) $-2(-1)^2 - 4(-1) - 1 = 1$

(c) $1 - 2x^2 - 1 = -2x^2$

(d) $2 - 2(-1)^2 = 0$

(e) $1 - 2(1 - 2x^2)^2$
 $= 1 - 2(1 - 4x^2 + 4x^4)$
 $= -8x^4 + 8x^2 - 1$

(f) $(-1+1)+1 = 1$

13) $3 \left(\frac{x+1}{x-1} \right) - 4 = \frac{3x+3-4x+4}{3x+3+3x-3}$
 $= \frac{-x+7}{6x}$

(a) $F \circ G(x) = \frac{-x+7}{6x} (x+1)$

(b) $F[G(x)] = \frac{-x+7}{6x} (x+1)$

(c) $\frac{-2+7}{6(-2)} = \frac{5}{-12}$

(d) $\frac{3x-4}{3x+3} + 1 = \frac{3x-4+3x+3}{3x+3-3x-3}$
 $= \frac{6x-1}{-7} (x+1)$

(e) $\frac{6y-1}{-7}$ (f) $\frac{6(2)-1}{-7} = -\frac{11}{7}$

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

$= (x-1)^2 + 1$

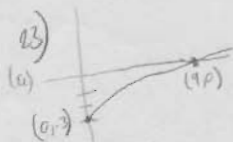
Denom: $x-1 \neq 0$
 $x \neq 1$



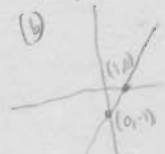
- 17) (a) 1
 (b) -3
 (c) -1
 (d) 2
 (e) 2
 (f) -3

20)

| | | | | | |
|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| x | 0 | $\frac{\pi}{6}$ | $\frac{\pi}{4}$ | $\frac{\pi}{3}$ | $\frac{\pi}{2}$ |
| $g \circ f(x)$ | $\frac{\pi}{2}$ | $\frac{\pi}{3}$ | $\frac{\pi}{4}$ | $\frac{\pi}{6}$ | 0 |

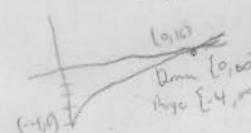


Domain: $[0, \infty)$
 Range: $[-3, \infty)$

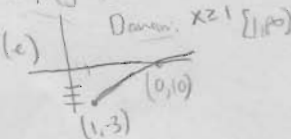


Domain: \mathbb{R}
 Range: \mathbb{R}

(c) $(f \circ g)(x) = \sqrt{x} - 3 - 1$
 $= \sqrt{x} - 4$



(d) $(g \circ f)(x) = \sqrt{x-1} - 3$



26) $V(t) = \frac{4}{3}\pi \left(\frac{1}{2}t+2\right)^3$
 $= \frac{4}{3}\pi \left(\frac{1}{8}t^3 + 3(\frac{1}{2}t)^2(2) + 3(\frac{1}{2}t)(2)^2 + 2^3\right)$
 $= \frac{\pi}{6}t^3 + 2\pi t^2 + 8\pi t + \frac{32\pi}{3}$

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$3\pi = \frac{4}{3}\pi \left(\frac{1}{2}t+2\right)^3$

$27 = \left(\frac{1}{2}t+2\right)^3$

$3 = \frac{1}{2}t+2$

$1 = \frac{1}{2}t$

$t = 2$

- 30) (a) $(a \circ c)(x)$
 (b) $(b \circ c)(x)$
 (c) $(c \circ a)(x)$

3.6 #2, 4, 8, 10, 13, 19, 23, 30, 32, 34, 43

2) $(f \circ g)(x) = (g \circ f)(x) = \frac{1}{x^2}$
 not inverses since compositions don't equal x .

4) (a) $-3\left(\frac{2}{3} - \frac{1}{3}x\right) + 2 = -2 + x - 2 = x - 4$ not inverse.

(b) $2\left(\frac{1}{2}x-1\right)+1 = x-2+1 = x-1$ not inverse.

(c) not inverse $x^3, 1-x^3$

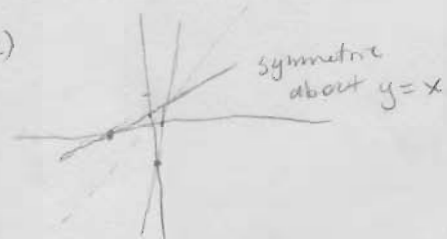
(d) $\sqrt[3]{x^3}$ inverse.

8) $f(a) = -2$

10) (a) $f(b) = 1$ (b) $f^{-1}(1) = 0$ (c) $f(-1) = -2$ (d) $f^{-1}(-2) = -1$

13) $y = 3x - 1$ (b) $(f \circ f^{-1})(x) = 3\left(\frac{x+1}{3}\right) - 1 = x$ ✓
 $x = 3y - 1$ (c) $(f^{-1} \circ f)(x) = \frac{3x+1}{3} = x$ ✓
 $\frac{x+1}{3} = y$

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



18) $x = \frac{2y-3}{y+4}$
 $xy + 4x = 2y - 3$
 $y(x-2) = -4x - 3$
 $y = \frac{-4x-3}{x-2}$

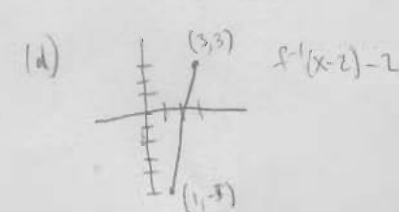
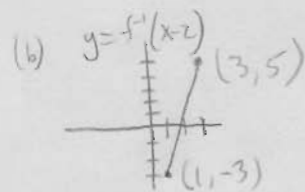
Domain f : $x \neq -4$ = Dom f^{-1}
 Domain f^{-1} : $x \neq 2$ = Range f .

23) (a)

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

(c)

(d) $f^{-1}(x-2) - 2$



30) gas cost $\neq y = x^2 - 1$

32) yes, are linear



34) (c)
(d)
(e)

- 43) A $(a, f(a))$
 B $(x(a), f(a))$
 C $(f(g(a)), f(a))$
 D $(f(a), f(g(a)))$

4.1 #2, 4, 10, 12, 14, 16, 18, 20, 21

2) $\frac{4-2}{-3-3} = \frac{-6}{-6} = 1$

$2 = 3 + b$

$f(x) = x - 1$

4) $m = \frac{4-5}{3-2} = -1$

$4 = f(2) = 5(2) + b$
 $b = -6$

$f(x) = 5x - 6$

10) they are not on a line.

12) (a) $V(t) = -11600t + 120000$

(b) $V(9) = 27,000$

14) $m = \frac{2(2-30)}{100-0} = \frac{180}{100} = \frac{9}{5}$

(a) $y = \frac{9}{5}x + 32$

(b) $98.6 = \frac{9}{5}x + 32$ $x = 37^\circ\text{C}$

(c) $z = \frac{9}{5}z + 32$

$-32 = \frac{4}{5}z$

$-40 = z$

6) (a) marginal cost 220

(b) $C(500) = 220(500) + 4000 = 114000$

(c) $C(501) = C(500) + 220 = 114220$

8) (a) $v = \frac{8-4}{6-1} = \frac{4}{5} \frac{\text{ft}}{\text{sec}}$

(b) $0 \frac{\text{cm}}{\text{sec}}$

(d) $8 \frac{\text{mi}}{\text{hr}}$

20) (a) $4 \frac{\text{cm}}{\text{sec}}$

(b) $x = 4(2) + 10 = 18$

(c) when $t=3$ $x = 18 + 4 = 22$

check: $4(3) + 10 = 22$ ✓

21) (a) $362091.5x - 6908790175$

b) 33,304,000

c) too low (1.7% error)