

Cumulative Review Test 2, page 389

- (a) $D = \mathbf{R}, R = \mathbf{R}$; is a function: each x -value corresponds to a unique y -value

(b) $D = \mathbf{R}, R = \{y \mid y > 0, y \in \mathbf{R}\}$; is a function: graph passes vertical line test

(c) $D =$ (about) $\{x \mid 0.98 \leq x \leq 3.02, x \in \mathbf{R}\}$;
 $R = \{y \mid -1.8 \leq y \leq 4.8, y \in \mathbf{R}\}$; not a function: fails vertical line test

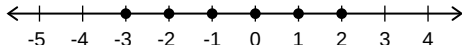
(d) $D = \{1, 2, 3, 4\}, R = \{5, 12, 23, 31\}$; not a function: 3 maps onto 12 and 31

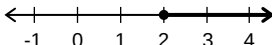
(e) $D = \{-1, 0, 3, 4, 5\}, R = \{2, 4, 5, 6, 9\}$; not a function: 3 maps onto 5 and 6

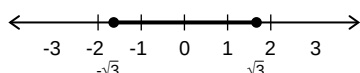
(f) $D = \{x \mid x \geq -\frac{5}{2}, x \in \mathbf{R}\}, \text{range} = \{y \mid y \geq 0, y \in \mathbf{R}\}$; is a function: each x -value corresponds to a unique y -value

(g) $D = \{x \mid x \leq -3, x \in \mathbf{R}\}, R = \mathbf{R}$; not a function: fails vertical line test

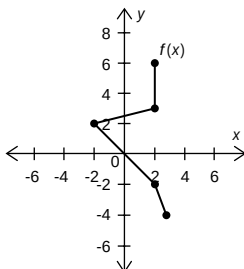
(h) $D = \{x \mid -3 \leq x \leq 3, x \in \mathbf{R}\}, R = \{y \mid -3 \leq y \leq 3, y \in \mathbf{R}\}$; not a function: fails vertical line test

- (a) -4 (b) -2 (c) $\frac{2}{3}$ (d) 4
- (a) 

(b) 

(c) 

- (a) $\{x \mid -2 < x < 11, x \in \mathbf{R}\}$
- (a)



- (b) $f(x)$ not a function: fails vertical line test
- (a) $(-5, -47), D = \mathbf{R}, R = \{y \mid y \geq -47, y \in \mathbf{R}\}$, parabola opens up; vertex $(-5, -47)$; zeros at $-11.8, 1.8$; y-intercept: -22

(b) $(-\frac{4}{3}, -\frac{16}{3}), D = \mathbf{R}, R = \{y \mid y \geq -\frac{16}{3}, y \in \mathbf{R}\}$, parabola opens up; vertex $(-\frac{4}{3}, -\frac{16}{3})$; zeros at $-2.67, 0$; y-intercept: 0

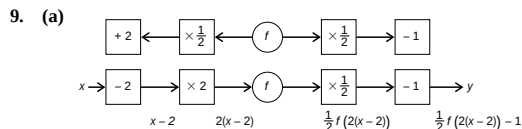
(c) $(-3, -14), D = \mathbf{R}, R = \{y \mid y \geq -14, y \in \mathbf{R}\}$, parabola opens up; vertex $(-3, -14)$; zeros at $-7.6, 1.53$; y-intercept: -8
- (a) g^{-1} is $y = \pm\sqrt{\frac{x+14}{2}} + 9 - 3, g(x)$: parabola opens up; vertex $(-3, -32)$; zeros at $-7, 1$; y-intercept: -14 ; g^{-1} : parabola opens right; vertex $(-32, -3)$; zeros at $-14, 1$; y-intercepts $-7, 1$, domain of $g(x) = \mathbf{R}$, range of $g(x) = \{y \mid y \geq -32, y \in \mathbf{R}\}$; domain of g^{-1} is $y = \{x \mid x \geq -32, x \in \mathbf{R}\}$, range of $g^{-1} = \mathbf{R}$

(b) $g^{-1}(x) = \frac{x^2 - 8}{4}, g(x)$: upper branch of parabola opens right; vertex $(-2, 0)$, y-intercept: 2.87 ; $g^{-1}(x)$: right branch of parabola opens up; vertex $(0, -2)$; zero at 2.87 , domain of $g(x) = \{x \mid x \geq -2, x \in \mathbf{R}\}$, range of $g(x) = \{y \mid y \geq 0, y \in \mathbf{R}\}$, domain of $g^{-1}(x) = \mathbf{R}$, range of $g^{-1}(x) = \{y \mid y \geq -2, y \in \mathbf{R}\}$

- (a) $f(x)$, narrower by $\frac{1}{3}$ (b) $f(x)$, wider by 2

(c) $f(x)$, 2 units right (d) $f(x)$, 2 units up

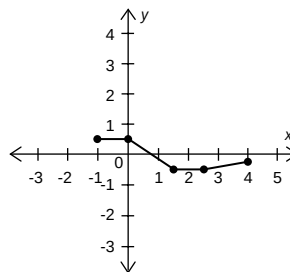
(e) $f(x)$, reflected in x -axis (f) $f(x)$, reflected in y -axis



- (b) $D = \{x \mid -1 \leq x \leq 4, x \in \mathbf{R}\}, R = \{y \mid -0.5 \leq y \leq 0.5, y \in \mathbf{R}\}$

(c) 0.25

(d)



- (a) $R(x) = -4x^2 + 28x$ (b) $P(x) = -4x^2 + 24x - 12$

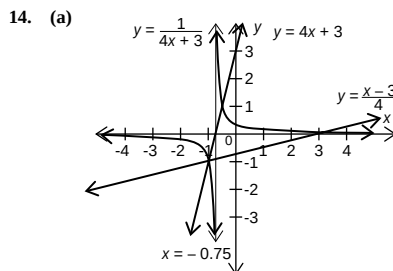
(c) -3 (d) 5.45 or 0.55

(e) parabola opens down, vertex $(3, 24)$, zeros at 0.6 and 5.47 ; y-intercept -12
- 202 500
- (a) 1 zero, touches x -axis at 1 point

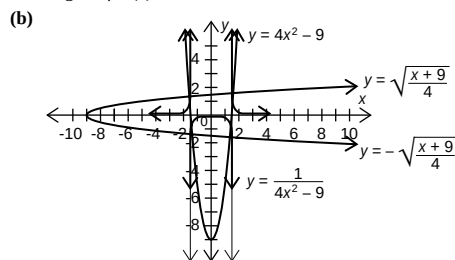
(b) 2 zeros, intersects x -axis at 2 points

(c) 1 zero, touches x -axis at 1 point
- (a) -3 or $\frac{1}{2}$ (b) $\pm 4i$

(c) $\frac{1 \pm 2\sqrt{2}i}{3}$ (d) $\frac{2 \pm 4\sqrt{6}i}{5}$



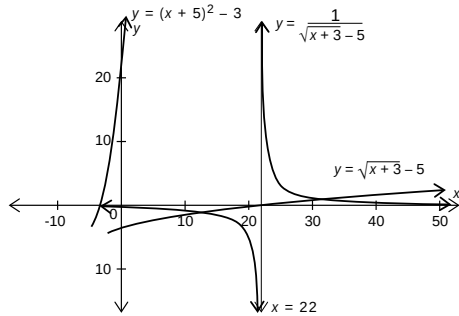
domain of $f(x) = \mathbf{R}$, range of $f(x) = \mathbf{R}$, domain of $\frac{1}{f(x)} = \{x \mid x \neq -\frac{3}{4}, x \in \mathbf{R}\}$, range of $\frac{1}{f(x)} = \{y \mid y \neq 0, y \in \mathbf{R}\}$, domain of $f^{-1}(x) = \mathbf{R}$, range of $f^{-1}(x) = \mathbf{R}$



domain of $f(x) = \mathbf{R}$, range of $f(x) = \mathbf{R}$, domain of $\frac{1}{f(x)} = \{x \mid x \neq \pm 1.5, x \in \mathbf{R}\}$, range of

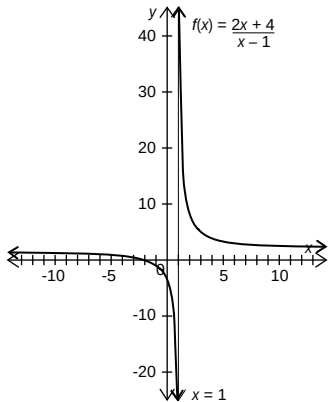
$$\frac{1}{f(x)} = \{y \mid y \neq 0, y \in \mathbf{R}\}, \text{ domain of } f^{-1}(x) = \{x \mid x \geq -9, x \in \mathbf{R}\}, \text{ range of } f^{-1}(x) = \mathbf{R}$$

(c)



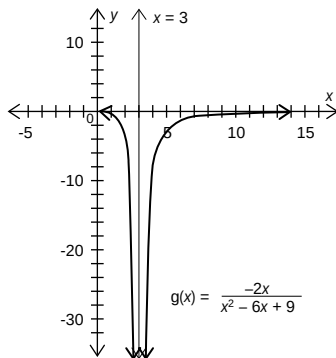
domain of $f(x) = \{x \mid x \geq -3, x \in \mathbf{R}\}$, range of $f(x) = \{y \mid y \geq -5, y \in \mathbf{R}\}$, domain of $\frac{1}{f(x)} = \{x \mid x \neq 22, x \in \mathbf{R}\}$, range of $f(x) = \{y \mid y \neq 0, y \in \mathbf{R}\}$, domain of $f^{-1}(x) = \{x \mid x \geq -5, x \in \mathbf{R}\}$, range of $f^{-1}(x) = \{y \mid y \geq -3, y \in \mathbf{R}\}$

15. (a) $x = -2, x = 1, D = \{x \mid x \neq 1, x \in \mathbf{R}\}$



$$R = \{y \mid y \neq 2, y \in \mathbf{R}\}$$

- (b) $x = 0, x = 3, D = \{x \mid x \neq 3, x \in \mathbf{R}\}$



$$R = \{y \mid y \neq 0, y \in \mathbf{R}\}$$

- (c) $x = 6 \text{ or } -5, x = -2, D = \{x \mid x \neq -2, x \in \mathbf{R}\}, R = \mathbf{R}$

16. (a) $8x^4 - x^3 + x^2 - 1$
 (b) $2x^4 + 5x^3 - 10x^2 - 20x + 8$
 (c) $-13x^3 + 8x^2 - 11x$
 (d) $-5x^6 - 6x^5 - 2x^4 + 22x^3 - 4x^2$
 (e) $-20x$ (f) $2x^3 + 29x^2 - 4x - 252$
 (g) $x^4 + 10x^3 + 19x^2 - 30x + 9$

17. (a) $\frac{2}{x-2}, x \neq 2$ (b) $\frac{-3p^3}{q}$
 (c) $\frac{2(5x-3)}{(x+1)^2}, x \neq -1$
 (d) $\frac{(a-5)(a+2)(a+4)}{(a-4)(a^2-5a-15)}, a \neq 4, -2.11, 7.11$
 (e) $\frac{(a+4b)(a-b)(a+5b)}{(a^2+14ab+20b^2)(a+2b)}, a \neq -2b, -7 \pm b\sqrt{29};$
 $b \neq -\frac{1}{2}a, -\frac{7}{20} \pm \frac{a\sqrt{29}}{20}$
 (f) $\frac{29-3b}{(b+7)(4-3b)}, b \neq -7, \frac{4}{3}$
 (g) $\frac{x+6}{(x+4)(x+3)(x+4)}, x \neq 4, -3, -4$
 (h) $\frac{b^3+2ab^2-3a^2-2ab}{ab(a+b)}, a \neq 0, -b; b \neq 0, -a$

18. (a) -16 (b) $2i$
 (c) 53 (d) $-5 - 2i$
 (e) $\frac{9}{55} - \frac{49}{55}i$ (f) $-297 + 54i$
 (g) $-\frac{23}{10} + \frac{7}{10}i$ (h) $-\frac{7}{10} - \frac{9}{10}i$