



PRECALCULUS

CHAPTER 1

Practice Test Answer Key

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① $y = 2x + 8$

Yes, it is a function because it is a line and lines pass the Vertical Line Test.



①

② $\{(2,1), (3,2), (-1,1), (0,-2)\}$

Yes, it is a function. Each input value leads to only one output value.

③ $f(x) = -3x^2 + 2x$

$$f(-2) = -3(-2)^2 + 2(-2)$$

$$= -3(4) - 4$$

$$= -12 - 4$$

$$= \boxed{-16}$$

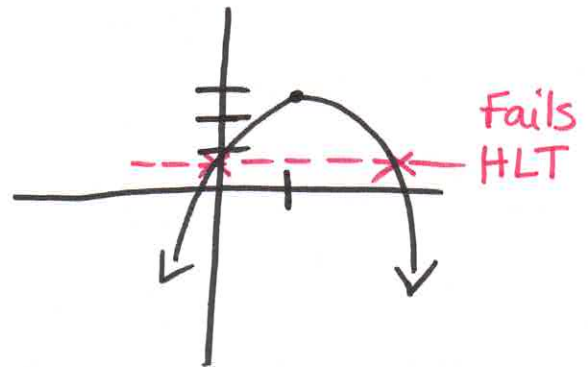
$$(4) f(x) = -3x^2 + 2x$$

$$f(a) = -3a^2 + 2a$$

$$(5) f(x) = -2(x-1)^2 + 3$$

This is a parabola. Parabolas are not one-to-one because they fail the Horizontal Line Test.

Rough sketch of $f(x)$:



$$(6) f(x) = \sqrt{3-x}$$

$$\begin{array}{r} 3-x \geq 0 \\ \underline{+x} \quad \underline{+x} \end{array}$$

$$3 \geq x$$

or

$$x \leq 3$$

$$\text{Domain: } (-\infty, 3]$$

$$\textcircled{7.} f(x) = 2x^2 - 5x$$

(p.3)

$$\begin{aligned} f(a+1) &= 2(a+1)^2 - 5(a+1) & f(1) &= 2(1)^2 - 5(1) \\ &= 2(a+1)(a+1) - 5a - 5 & &= 2(1) - 5 \\ &= 2(a^2 + 2a + 1) - 5a - 5 & &= 2 - 5 \\ &= 2a^2 + 4a + 2 - 5a - 5 & &= -3 \\ &= 2a^2 - a - 3 \end{aligned}$$

$$\begin{aligned} f(a+1) - f(1) &= 2a^2 - a - 3 - (-3) \\ &= 2a^2 - a - 3 + 3 \\ &= \boxed{2a^2 - a} \end{aligned}$$

$$\textcircled{8.} f(x) = \begin{cases} x+1 & \text{if } -2 < x < 3 \\ -x & \text{if } x \geq 3 \end{cases}$$

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

x	f(x)
-2	-1
0	1
3	4

← open circle

← open circle

$$f(x) = -x:$$

x	f(x)
3	-3
4	-4
5	-5

(work on next page)

$$\underline{f(x) = x + 1:}$$

$$f(-2) = -2 + 1 \\ = -1$$

$$f(0) = 0 + 1 \\ = 1$$

$$f(3) = 3 + 1 \\ = 4$$

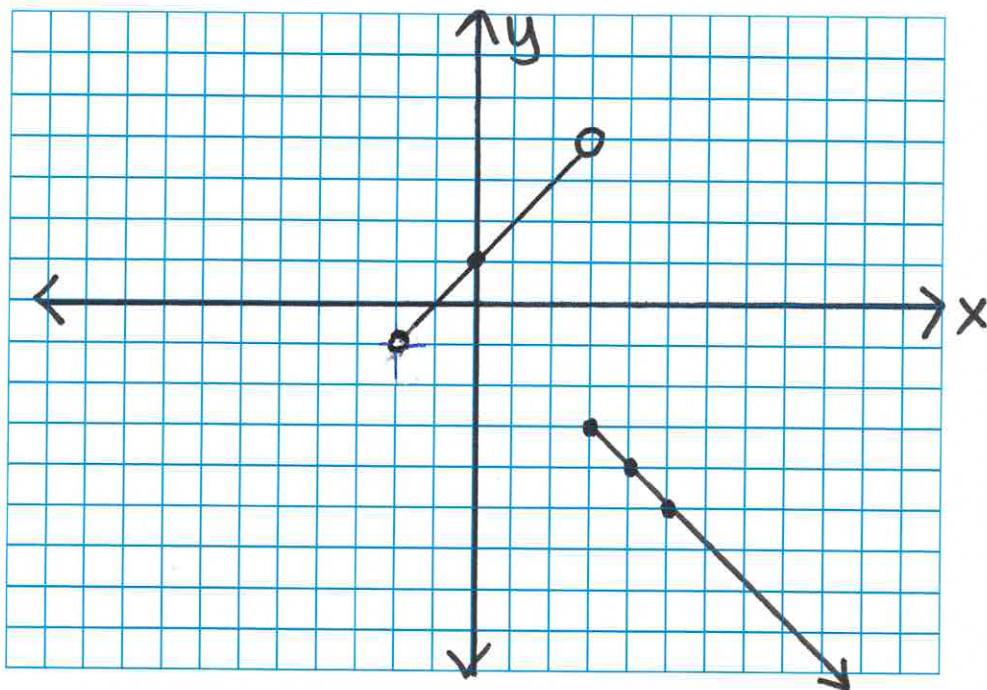
$$\underline{f(x) = -x:}$$

$$f(3) = -3$$

$$f(4) = -4$$

$$f(5) = -5$$

0.4



$$\textcircled{9.} f(x) = 3 - 2x^2 + x$$

(p.5)

$$\frac{f(b) - f(a)}{b - a} = \frac{3 - 2(b)^2 + b - (3 - 2a^2 + a)}{b - a}$$

$$= \frac{3 - 2b^2 + b - 3 + 2a^2 - a}{b - a}$$

$$= \frac{-2b^2 + b + 2a^2 - a}{b - a}$$

$$= \frac{-2b^2 + 2a^2 + b - a}{b - a}$$

$$= \frac{-2(b^2 - a^2) + b - a}{b - a}$$

$$= \frac{-2(b - a)(b + a) + (b - a)}{b - a}$$

$$= \frac{(b - a)(-2(b + a) + 1)}{b - a}$$

$$= \frac{(b-a)(-2(b+a)+1)}{b-a}$$

$$= \boxed{-2(b+a)+1}$$

(p.6)

⑩. $f(x) = 3 - 2x^2 + x$ and $g(x) = \sqrt{x}$

$$(g \circ f)(x) = g(f(x)) = \boxed{\sqrt{3 - 2x^2 + x}}$$

⑪. $f(x) = 3 - 2x^2 + x$ and $g(x) = \sqrt{x}$

$$(g \circ f)(1) = g(f(1))$$

$$f(1) = 3 - 2(1)^2 + 1$$

$$= 3 - 2 + 1$$

$$= 2$$

$$g(2) = \sqrt{2}$$

So, $\boxed{g(f(1)) = \sqrt{2}}$

12. $H(x) = \sqrt[3]{5x^2 - 3x}$

$(f \circ g)(x) = f(g(x)) = H(x)$

$f(x) = \sqrt[3]{x}$, $g(x) = 5x^2 - 3x$

13. $f(x) = \sqrt{x+6} - 1$
 ↑ ↙
 6 units left 1 unit down

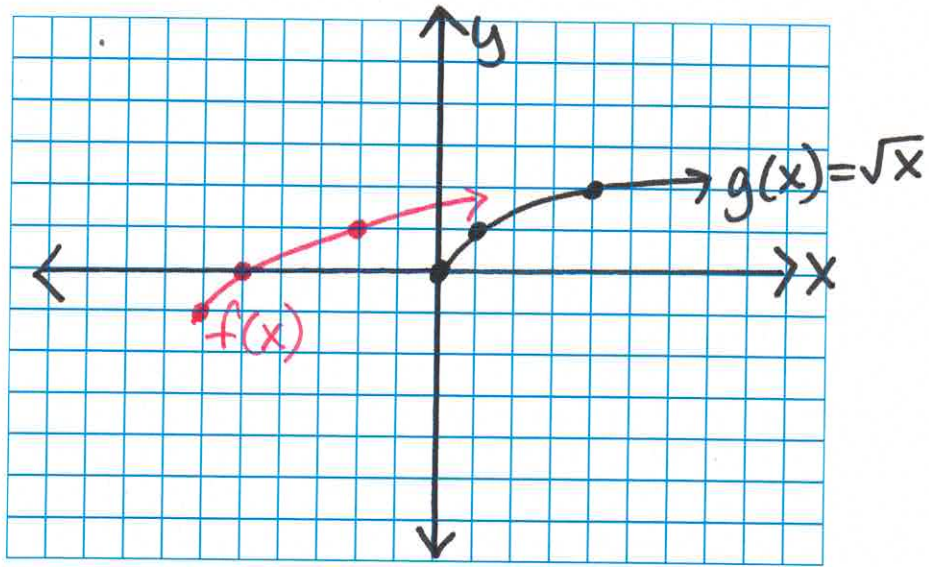
$g(x) = \sqrt{x}$

Key points: (0,0) (1,1) (4,2)

Domain:
[0, ∞)

$f(x) \rightarrow$ move 6 units left
and 1 unit down

Graph on next page



⑭. $f(x) = \frac{1}{x+2} - 1$

\uparrow 2 units left \nwarrow 1 unit down

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

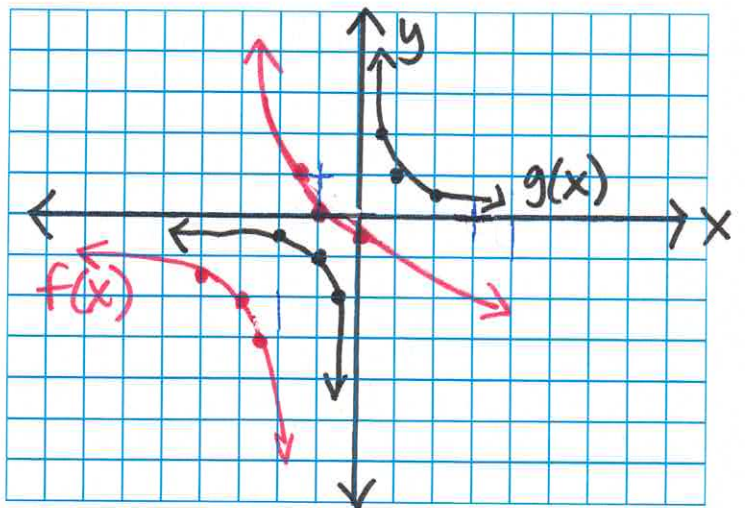
Key points :

$(-1, -1)$	$(1, 1)$
$(-2, -\frac{1}{2})$	$(2, \frac{1}{2})$
$(-\frac{1}{2}, -2)$	$(\frac{1}{2}, 2)$

2 left, down 1

Domain :

$(-\infty, 0) \cup (0, \infty)$



$$(15.) f(x) = -\frac{5}{x^2} + 9x^6$$

(p.9)

$$f(-x) = \frac{-5}{(-x)^2} + 9(-x)^6$$

$$= \frac{-5}{x^2} + 9x^6$$

Since $f(-x) = f(x)$, the function is **even**.

$$(16.) f(x) = -\frac{5}{x^3} + 9x^5$$

$$f(-x) = \frac{-5}{(-x)^3} + 9(-x)^5$$

$$= \frac{-5}{-x^3} - 9x^5$$

$$= \frac{5}{x^3} - 9x^5$$

$$= -f(x)$$

Since $f(-x) = -f(x)$,
the function
is **odd**.

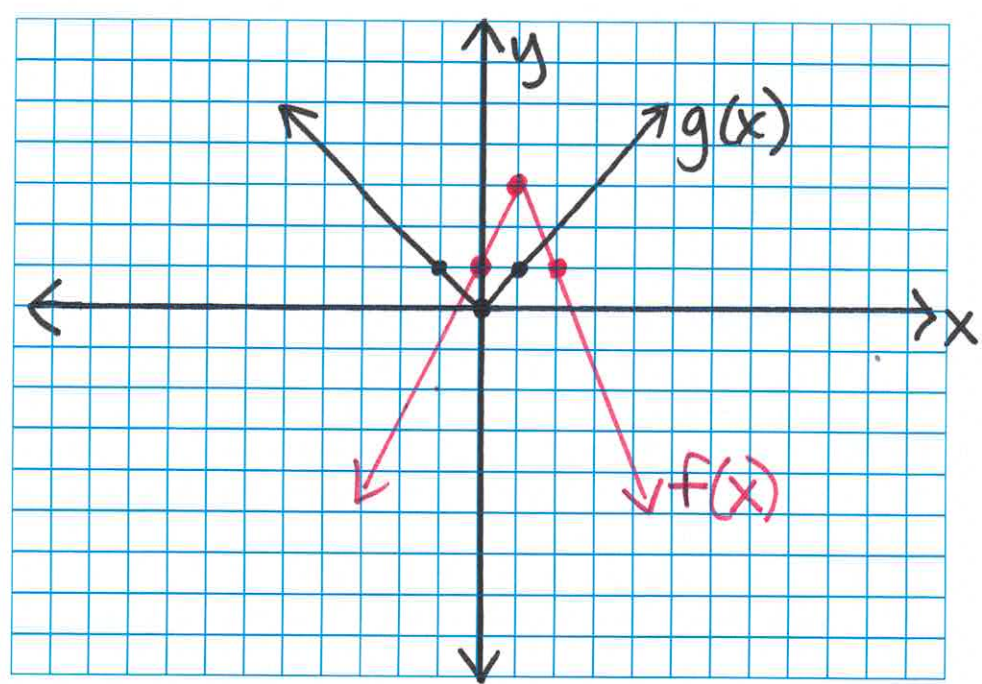
17. $f(x) = \frac{1}{x}$

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

$f(x) = -f(x)$ which means $f(x)$ is odd.

18. $f(x) = -2|x-1|+3$
y by -2 right 1 up 3

$g(x) = |x|$ Key points: (-1,1) (0,0) (1,1)
y by -2: (-1,-2) (0,0) (1,-2)
} right 1, up 3



(19.) $|2x-3|=17$

$$2x-3=17 \quad \text{or} \quad 2x-3=-17$$

$$\begin{array}{r} +3 \quad +3 \\ \hline 2x = 20 \\ \hline x = 10 \end{array}$$

$x=10$

$$\begin{array}{r} +3 \quad +3 \\ \hline 2x = -14 \\ \hline x = -7 \end{array}$$

$x=-7$

(20.) $\cancel{x} \left| \frac{1}{3}x - 3 \right| \geq \frac{17}{-1}$

$$\left| \frac{1}{3}x - 3 \right| \leq -17$$

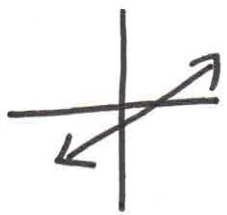
Cannot apply the definition because the constant is negative.

Logically, the absolute value of a number will never be less than a negative number. So there is

$\boxed{\text{no solution}}$ here.

21. $f(x) = 3x - 5$

p.12

 This is a line, so it is one-to-one

$$y = 3x - 5$$

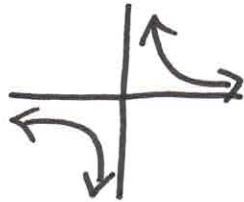
$$x = 3y - 5$$

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

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

$$f^{-1}(x) = \frac{x+5}{3}$$

22. $f(x) = \frac{4}{x+7}$



This is a one-to-one function.

$$y = \frac{4}{x+7}$$

$$(y+7)(x) = \left(\frac{4}{y+7}\right)(y+7)$$

$$x(y+7) = 4$$

$$\frac{x(y+7)}{x} = \frac{4}{x}$$

$$y+7 = \frac{4}{x} - 7$$

$$y = \frac{4}{x} - 7$$

$$f^{-1}(x) = \frac{4}{x} - 7$$

23. Increasing on $(-\infty, -1.1)$ and $(1.1, \infty)$ p.13

24. Decreasing on $(-1.1, 1.1)$

25. Local minimum: $(1.1, -0.9)$

26. Local maximum: $(-1.1, 0.9)$

27. $f(2) = 2$

28. $f(-2) = 2$

29.
$$f(x) = \begin{cases} |x| & \text{if } x \leq 2 \\ 3 & \text{if } x > 2 \end{cases}$$

30. $F(6) = 13$

31. $\hat{F}(x) = 5$
 $\hat{y} = 5$, so $x = 2$

32. The function is increasing on its domain (the y-values increase as the x-values increase).

33. Yes, each y-value corresponds to exactly one x-value.

34. $f^{-1}(15)$

This is saying $y=15$, find the x that goes with it.

$f^{-1}(15) = 7$

35. $f(x) = -2x + 11$

This is a line so it is one-to-one.

$y = -2x + 11$
 $x = -2y + 11$
-11 -11

$\frac{x-11}{-2} = \frac{-2y}{-2}$

$\frac{x-11}{-2} = y$

$f^{-1}(x) = \frac{x-11}{-2}$