Chapter 6 Review Worksheet *Name:* KEY

Evaluate the expression without using a calculator.

1.) $36^{3/2}$

$(\sqrt{36})^3$

$(6)^3$

$\boxed{216}$

2.) $64^{-2/3}$

$\frac{1}{64^{2/3}}$

$\frac{1}{(\sqrt[3]{64})^2}$

$\frac{1}{(4)^2}$ $\boxed{\frac{1}{16}}$

3.) $-(625^{3/4})$

$-((\sqrt[4]{625})^3)$

$-(5)^3$

$\boxed{-125}$

4.) $(-32)^{2/5}$

$(\sqrt[5]{-32})^2$

$(-2)^2$

$\boxed{4}$

Solve the equation. Round your answer to two decimal places when necessary.

5.) $x^4 = 20$

$\sqrt[4]{x^4} = \sqrt[4]{20}$

$\boxed{x \approx \pm 2.11}$

6.) $x^5 = -10$

$\sqrt[5]{x^5} = \sqrt[5]{-10}$

$\boxed{x \approx -1.58}$

7.) $x^6 + 5 = 26$

$x^6 = 21$

$\sqrt[6]{x^6} = \sqrt[6]{21}$

$\boxed{x \approx \pm 1.66}$

8.) $(x+3)^3 = -16$

$\sqrt[3]{(x+3)^3} = \sqrt[3]{-16}$

$x + 3 = -2.52$

$\boxed{x \approx -5.52}$

Simplify the expression. Assume all variables are positive.

9.) $\frac{\sqrt[4]{96x^3y^6}}{\sqrt[4]{4y^2}}$

$\sqrt[4]{\frac{96x^3y^6}{4y^2}}$

$\sqrt[4]{24x^3y^4}$ $\boxed{y\sqrt[4]{24x^3}}$

10.) $\frac{\sqrt[4]{32}}{\sqrt[4]{2}}$

$\sqrt[4]{16}$

$\boxed{2}$

11.) $x^{5/3} \bullet x^{4/3}$

$x^{5/3 + 4/3}$

$x^{9/3}$

$\boxed{x^3}$

12.) $\left(\frac{x^2}{27}\right)^{1/3}$

$\frac{x^{2/3}}{27^{1/3}}$

$\boxed{\frac{x^{2/3}}{3}}$

13.) $\frac{x^{7/5}}{x^{4/5}}$

$x^{7/5 - 4/5}$

$\boxed{x^{3/5}}$

14.) $\sqrt{x^3y^4z} \bullet \sqrt{xyz^4}$

$\sqrt{x^4y^5z^5}$

$\sqrt{\underline{x^2} \cdot \underline{x^2} \cdot y^2 \cdot y^2 \cdot y \cdot \underline{z^2} \cdot \underline{z^2} \cdot z}$

$\boxed{x^2y^2z^2\sqrt{yz}}$

15.) $\sqrt[3]{81} - \sqrt[3]{24}$

$\sqrt[3]{27}\ \sqrt[3]{3}\quad \sqrt[3]{8}\ \sqrt[3]{3}$

$3\sqrt[3]{3} - 2\sqrt[3]{3}$

$\boxed{\sqrt[3]{3}}$

16.) $5\sqrt[3]{48} - \sqrt[3]{750}$

$5\sqrt[3]{8}\sqrt[3]{6}\quad \sqrt[3]{125}\sqrt[3]{6}$

$5 \cdot 2\sqrt[3]{6} - 5\sqrt[3]{6}$

$10\sqrt[3]{6} - 5\sqrt[3]{6}$

$\boxed{5\sqrt[3]{6}}$

17.) $\sqrt[3]{\frac{1}{6}}$

$\frac{\sqrt[3]{1}}{\sqrt[3]{6}}$

$\frac{1}{\sqrt[3]{6}} \cdot \frac{\sqrt[3]{36}}{\sqrt[3]{36}}$

$\frac{\sqrt[3]{36}}{\sqrt[3]{216}}$ $\boxed{\frac{\sqrt[3]{36}}{6}}$

Let $f(x) = 4x^2 - x$ and $g(x) = 2x^2$. **Perform the indicated operation and state the domain.**

18.) $f(x) + g(x)$

$(4x^2 - x) + (2x^2)$

$\boxed{6x^2 - x}$

$\boxed{D: \mathbb{R}}$

19.) $g(x) - f(x)$

$(2x^2) - (4x^2 - x)$

$2x^2 - 4x^2 + x$

$\boxed{-2x^2 + x}$

$\boxed{D: \mathbb{R}}$

20.) $f(x) \bullet g(x)$

$(4x^2 - x)(2x^2)$

$\boxed{8x^4 - 2x^3}$

$\boxed{D: \mathbb{R}}$

21.) $\frac{f(x)}{g(x)}$

$\frac{4x^2 - x}{2x^2}$

$\frac{\cancel{x}(4x^2 - 1)}{\cancel{x}(2x)}$

$\boxed{\frac{4x^2 - 1}{2x}}$

$\boxed{D: \mathbb{R},\ x \neq 0}$

22.) $f(g(x))$

$f(2x^2)$

$4(2x^2)^2 - (2x^2)$

$4(4x^4) - 2x^2$

$\boxed{16x^4 - 2x^2}$

$\boxed{D: \mathbb{R}}$

23.) $g(f(x))$

$g(4x^2 - x)$

$2(4x^2 - x)^2$

$2(4x^2 - x)(4x^2 - x)$

$2(16x^4 - 4x^3 - 4x^3 + x^2)$

$2(16x^4 - 8x^3 + x^2)$

$\boxed{32x^4 - 16x^3 + 2x^2}$

$\boxed{D: \mathbb{R}}$

24.) $f(f(x))$

$f(4x^2 - x)$

$4(4x^2 - x)^2 - (4x^2 - x)$

$4(4x^2 - x)(4x^2 - x) - 4x^2 + x$

$4(16x^4 - 8x^3 + x^2) - 4x^2 + x$

$64x^4 - 32x^3 + 4x^2 - 4x^2 + x$

$\boxed{64x^4 - 32x^3 + x}$

$\boxed{D: \mathbb{R}}$

25. $g(g(x))$

$g(2x^2)$

$2(2x^2)^2$

$2(4x^4)$ $\boxed{8x^4}$ $\boxed{D: \mathbb{R}}$

Find the inverse of the function.

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

$x = -\frac{1}{3}y + 5$

$x - 5 = -\frac{1}{3}y$

$-3(x - 5) = (-\frac{1}{3}y)-3$

$\boxed{y = -3x + 15}$

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

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

$-\frac{9}{2}(x) = (-\frac{2}{9}y^5) - \frac{9}{2}$

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

$\sqrt[5]{-\frac{9}{2}x} = \sqrt[5]{y^5}$

$y = \sqrt[5]{-\frac{9}{2}x} \cdot \frac{\sqrt[5]{16}}{\sqrt[5]{16}}$

$= \sqrt[5]{\frac{-144}{32}x}$

$\boxed{y = \frac{1}{2}\sqrt[5]{-144x}}$

28.) $f(x) = -3x^3 - 4$

$x = -3y^3 - 4$

$x + 4 = -3y^3$

$\frac{x+4}{-3} = y^3$

$\sqrt[3]{\frac{x+4}{-3}} = \sqrt[3]{y^3}$

$y = \sqrt[3]{\frac{x+4}{-3}} \cdot \frac{\sqrt[3]{9}}{\sqrt[3]{9}}$

$y = \sqrt[3]{\frac{9x+36}{-27}}$

$\boxed{y = -\frac{1}{3}\sqrt[3]{9x+36}}$

29.) $f(x) = 9x^4 - 49, x \le 0$

$x = 9y^4 - 49$

$x + 49 = 9y^4$

$\frac{x+49}{9} = y^4$

$\sqrt[4]{\frac{x+49}{9}} = \sqrt[4]{y^4}$

$y = -\sqrt[4]{\frac{x+49}{9}} \cdot \frac{\sqrt[4]{9}}{\sqrt[4]{9}}$

$y = -\sqrt[4]{\frac{9x+441}{81}}$

$\boxed{y = \frac{1}{3}\sqrt[4]{9x+441}}$

Verify that *f* and *g* are inverse functions.

30.) $f(x) = 3x - 9$; $g(x) = \frac{x+9}{3}$

$f(g(x))$

$f\left(\frac{x+9}{3}\right)$

$3\left(\frac{x+9}{3}\right) - 9$

$x + 9 - 9$

$\boxed{x}$

$g(f(x))$

$g(3x-9)$

$\frac{(3x-9)+9}{3}$

$\frac{3x}{3}$

$\boxed{x}$

31.) $f(x) = 5x^3$; $g(x) = \sqrt[3]{\frac{x}{5}}$

$f(g(x))$

$f\left(\sqrt[3]{\frac{x}{5}}\right)$

$5\left(\sqrt[3]{\frac{x}{5}}\right)^3$

$5\left(\frac{x}{5}\right)$

$\boxed{x}$

$g(f(x))$

$g(5x^3)$

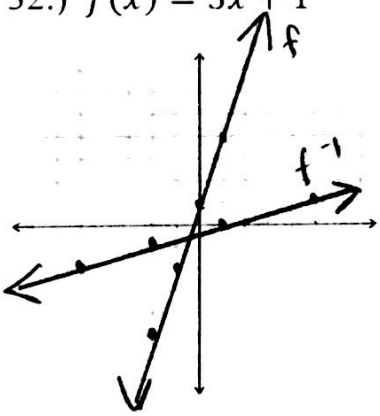
$\sqrt[3]{\frac{(5x^3)}{5}}$

$\sqrt[3]{x^3}$

$\boxed{x}$

Graph the function *f*. Use the horizontal line test to determine whether the inverse of *f* is a function. Then graph the inverse of *f*.

32.) $f(x) = 3x + 1$



f

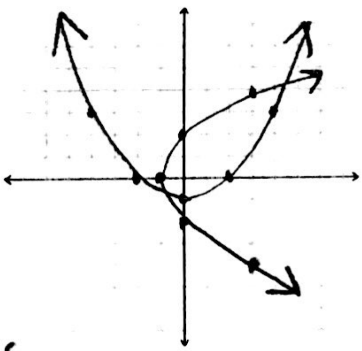
x	y
-2	-5
-1	-2
0	1
1	4
2	7

f^{-1}

x	y
-5	-2
-2	-1
1	0
4	1
7	2

yes, f passes HLT & f^{-1} passes VLT

33.) $f(x) = \frac{1}{4}x^2 - 1$



f

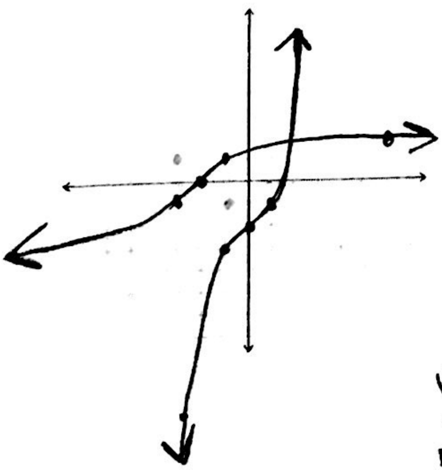
x	y
-4	3
-2	0
0	-1
2	0
4	3

f^{-1}

x	y
3	-4
0	-2
-1	0
0	2
3	4

No, f fails HLT & f^{-1} fails VLT

34.) $f(x) = x^3 - 2$



f

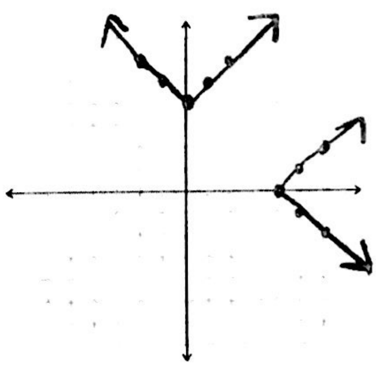
x	y
-2	-10
-1	-3
0	-2
1	-1
2	6

f^{-1}

x	y
-10	-2
-3	-1
-2	0
-1	1
6	2

yes, f passes HLT & f^{-1} passes VLT

35.) $f(x) = |x| + 4$



f

x	y
-2	6
-1	5
0	4
1	5
2	6

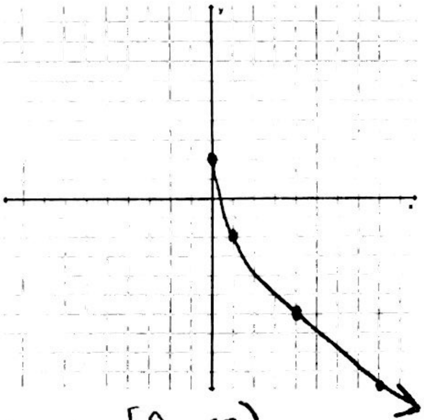
f^{-1}

x	y
6	-2
5	-1
4	0
5	1
6	2

no, f fails HLT & f^{-1} fails VLT

Graph the function. Then state the domain and range. Lastly, compare the function with its parent function.

36.) $y = -4\sqrt{x} + 2$



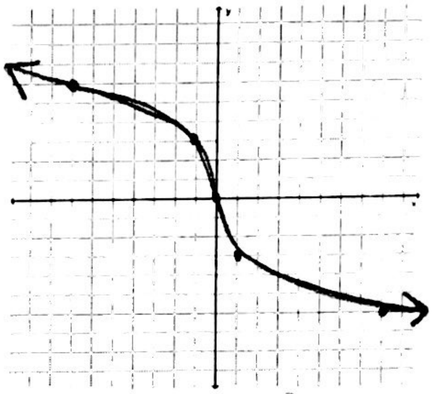
x	y
0	2
1	-2
4	-6
9	-10

domain: $[0, \infty)$

range: $(-\infty, 2]$

comparison:
- reflection over x-axis
- vertical stretch
- up 2

37.) $y = -3\sqrt[3]{x}$



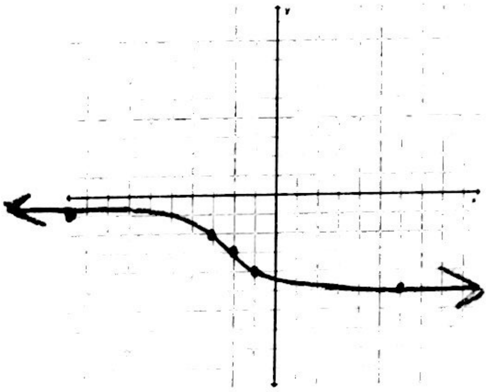
x	y
-8	6
-1	3
0	0
1	-3
8	-6

domain: $(-\infty, \infty)$

range: $(-\infty, \infty)$

comparison:
- reflection over x-axis
- vertical stretch

38.) $y = -\sqrt[3]{x+2} - 3$



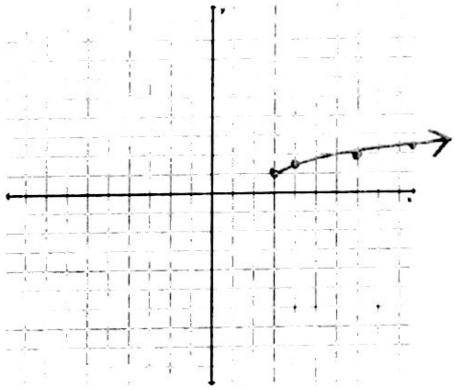
x	y
-10	-1
-3	-2
-2	-3
-1	-4
6	-5

domain: $(-\infty, \infty)$

range: $(-\infty, \infty)$

comparison:
- reflection over x-axis
- left 2
- down 3

39.) $y = \frac{1}{2}\sqrt{x-3} + 1$



x	y
3	1
4	1.5
7	2
10	2.32

domain: $[3, \infty)$

range: $[1, \infty)$

comparison:
- vertical shrink
- right 3
- up 1

Solve the equation. Remember that you can check your solution.

40.) $\sqrt{6x+15} = 9$

$(\sqrt{6x+15})^2 = (9)^2$

$6x + 15 = 81$

$6x = 66$

$\boxed{x = 11}$

41.) $\sqrt[3]{3x+5} + 2 = 5$

$\sqrt[3]{3x+5} = 3$

$(\sqrt[3]{3x+5})^3 = (3)^3$

$3x + 5 = 27$

$3x = 22$

$\boxed{x = \frac{22}{3}}$

42.) $8(10x)^{1/2} - 7 = 9$

$8(10x)^{1/2} = 16$

$(10x)^{1/2} = 2$

$((10x)^{1/2})^2 = (2)^2$

$10x = 4$

$\boxed{x = 2/5}$

43.) $2x^{5/3} + 4 = -60$

$2x^{5/3} = -64$

$x^{5/3} = -32$

$(\sqrt[3]{x})^5 = -32$

$\sqrt[5]{(\sqrt[3]{x})^5} = \sqrt[5]{-32}$

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

$(\sqrt[3]{x})^3 = (-2)^3$ $\boxed{x = -8}$

Solve the equation. Check for extraneous solutions.

44.) $\sqrt[3]{4x-9} = \sqrt[3]{2x-4}$

$(\sqrt[3]{4x-9})^3 = (\sqrt[3]{2x-4})^3$

$4x - 9 = 2x - 4$

$2x = 5$

$\boxed{x = 5/2}$

$\sqrt[3]{4(5/2) - 9} = \sqrt[3]{2(5/2) - 4}$

$\sqrt[3]{10-9} = \sqrt[3]{5-4}$

$\sqrt[3]{1} = \sqrt[3]{1}$ ✓

45.) $x - 3 = \sqrt{10x - 54}$

$(x-3)^2 = (\sqrt{10x-54})^2$

$x^2 - 6x + 9 = 10x - 54$

$x^2 - 16x + 63 = 0$

$(x-9)(x-7) = 0$

$\boxed{x = 9}$ $\boxed{x = 7}$

$9 - 3 = \sqrt{10(9) - 54}$ $7 - 3 = \sqrt{10(7) - 54}$

$6 = \sqrt{36}$ $4 = \sqrt{16}$

$6 = 6$ ✓ $4 = 4$ ✓