Unit 3 Test Study Guide B
(Parent Functions & Transformations)

Name: Key

Date: _____ Block: _____

Convert each equation to vertex form. Then state the vertex.

16. $f(x)=x^2-16x+64$

$f(x)=(x^2-16x)+64$

$\downarrow$

$\frac{-16}{2}=-8 \quad (-8)^2=64$

$f(x)=(x^2-16x+64)+64-64$

$\boxed{f(x)=(x-8)^2}$

$\boxed{V:\ (8,0)}$

17. $f(x)=x^2+2x-8$

$f(x)=(x^2+2x)-8$

$\downarrow$

$\frac{2}{2}=1 \quad (1)^2=1$

$f(x)=(x^2+2x+1)-8-1$

$\boxed{f(x)=(x+1)^2-9}$

$\boxed{V:\ (-1,-9)}$

18. $f(x)=-x^2+10x-23$

$f(x)=-(x^2-10x)-23$

$\downarrow$

$\frac{-10}{2}=-5 \quad (-5)^2=25$

$f(x)=-(x^2-10x+25)-23+25$

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

$\boxed{V:\ (5,2)}$

19. $f(x)=-2x^2+12x-19$

$f(x)=-2(x^2-6x)-19$

$\downarrow$

$\frac{-6}{2}=-3 \quad (-3)^2=9$

$f(x)=-2(x^2-6x+9)-19+18$

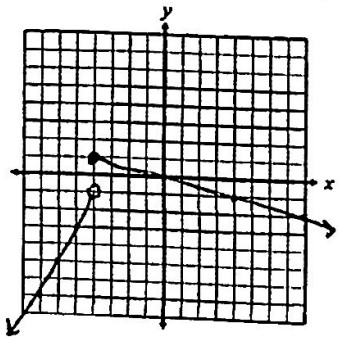
$\boxed{f(x)=-2(x-3)^2-1}$

$\boxed{V:\ (3,-1)}$

Topic 5: Piecewise Functions

Graph each function. State the domain and range.

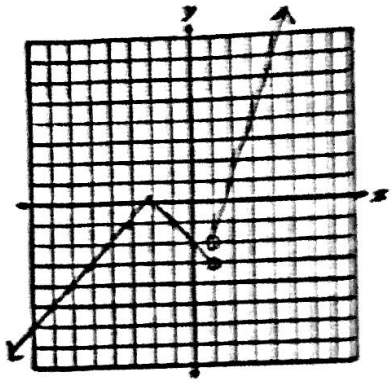
20. $f(x)=\begin{cases} 2x+7 & \text{if } x<-4 \\ -\frac{1}{4}x & \text{if } x\geq -4 \end{cases}$



Domain: $\{\mathbb{R}\}$

Range: $\{y \mid y \leq 1\}$

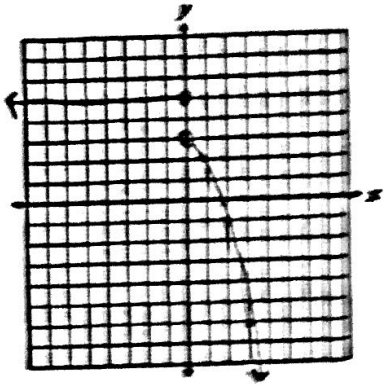
21. $g(x)=\begin{cases} -|x+2| & \text{if } x<1 \\ 3x-5 & \text{if } x>1 \end{cases}$



Domain: $\{x \mid x \neq 1\}$

Range: $\{\mathbb{R}\}$

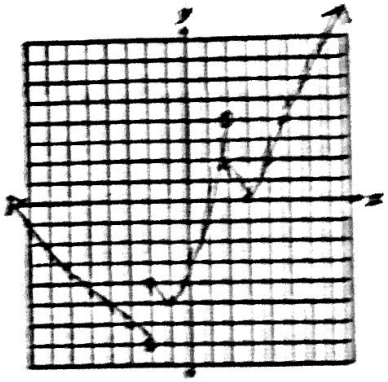
22. $p(x)=\begin{cases} 5 & \text{if } x\le 0 \\ -x^2+3 & \text{if } x>0 \end{cases}$



Domain: $\{\mathbb{R}\}$

Range: $\{y \mid y<3 \cup y=5\}$

23. $h(x)=\begin{cases} -x-9 & \text{if } x<-2 \\ (x+1)^2-5 & \text{if } -2\le x<2 \\ 2|x-3| & \text{if } x\ge 2 \end{cases}$



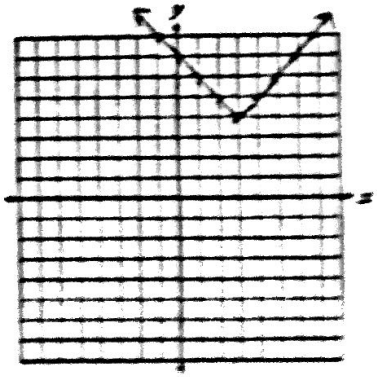
Domain: $\{\mathbb{R}\}$

Range: $\{y \mid y\ge 7\}$

Topic 6: Mixed Review - Linear, Absolute Value, and Quadratic

Graph each function and identify its characteristics.

24. $f(x)=|x-3|+4$



Parent function: Absolute Value

D: $\{\mathbb{R}\}$ R: $\{y \mid y\ge 4\}$

Number of roots: 0

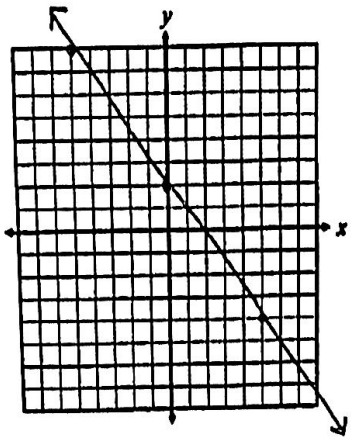
End behavior: As $x\to\infty$, $f(x)\to\infty$

As $x\to-\infty$, $f(x)\to\infty$

Increasing interval: $(3, \infty)$

Decreasing interval: $(-\infty, 3)$

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



Parent Function: Linear

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

Number of roots: 1

End Behavior: As $x \to \infty$, $f(x) \to$ $-\infty$

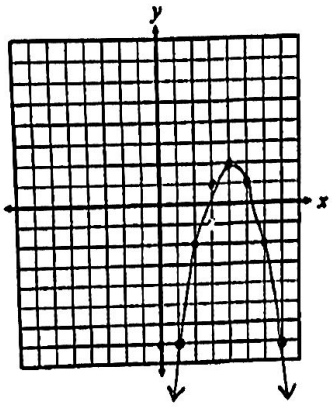
As $x \to -\infty$, $f(x) \to$ ∞

Increasing Interval: N/A

Decreasing Interval: $(-\infty, \infty)$

26. $f(x) = -x^2 + 8x - 14$

x	y
1	-7
2	-2
3	-1
4	2
5	1
6	-2
7	-7



Parent Function: Quadratic

D: $\{\mathbb{R}\}$; R: $\{y \mid y \leq 2\}$

Number of roots: 2

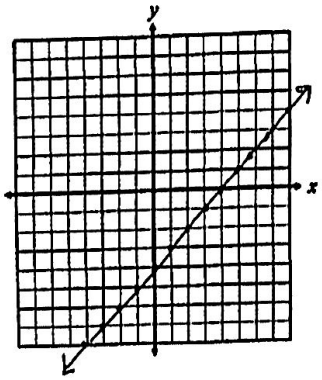
End Behavior: As $x \to \infty$, $f(x) \to$ $-\infty$

As $x \to -\infty$, $f(x) \to$ $-\infty$

Increasing Interval: $(-\infty, 4)$

Decreasing Interval: $(4, \infty)$

27. $f(x) = x - 4$



Parent Function: Linear

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

Number of roots: 1

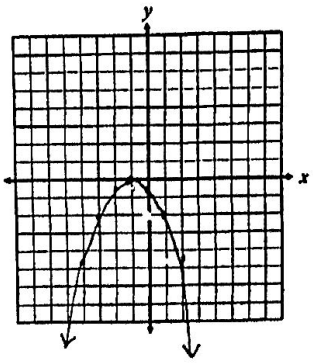
End Behavior: As $x \to \infty$, $f(x) \to$ ∞

As $x \to -\infty$, $f(x) \to$ $-\infty$

Increasing Interval: $(-\infty, \infty)$

Decreasing Interval: N/A

28. $f(x) = -\frac{1}{2}(x+1)^2$



Parent Function: Quadratic

D: $\{\mathbb{R}\}$; R: $\{y \mid y \leq 0\}$

Number of roots: 1

End Behavior: As $x \to \infty$, $f(x) \to$ $-\infty$

As $x \to -\infty$, $f(x) \to$ $-\infty$

Increasing Interval: $(-\infty, -1)$

Decreasing Interval: $(-1, \infty)$