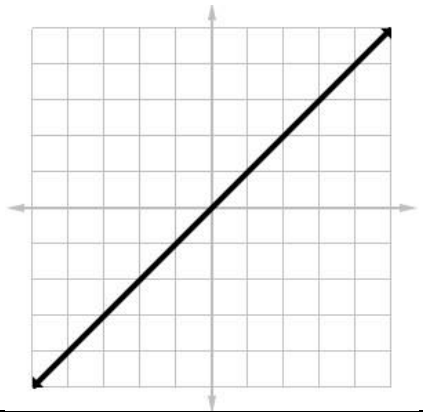
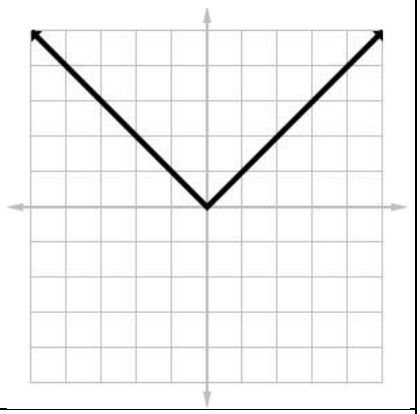
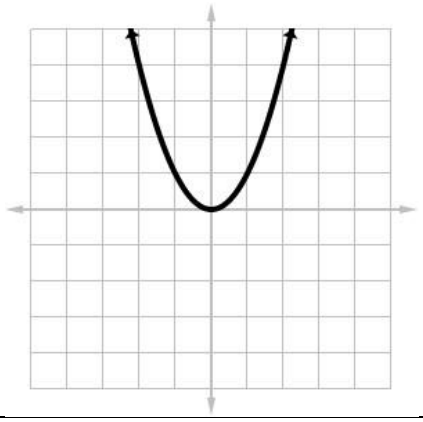
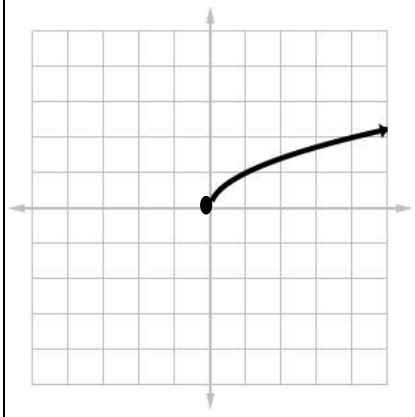
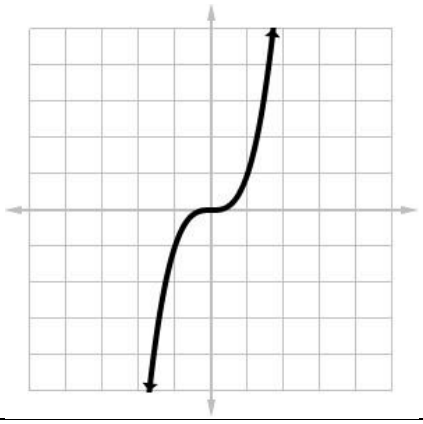
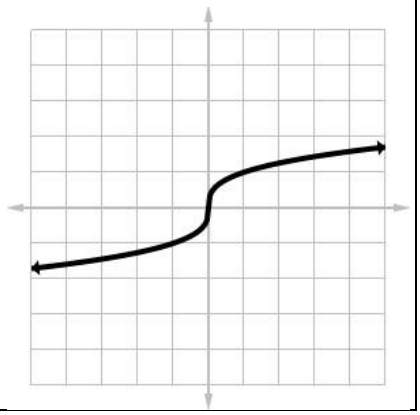
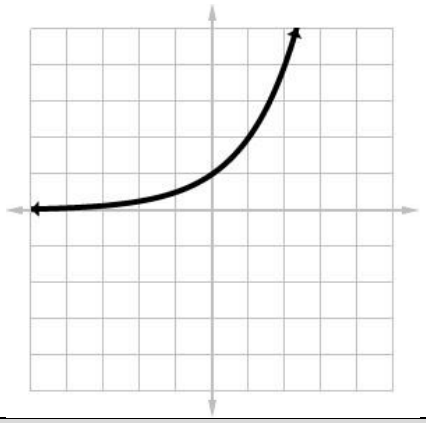
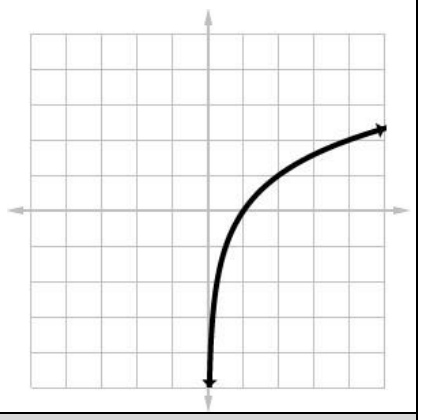
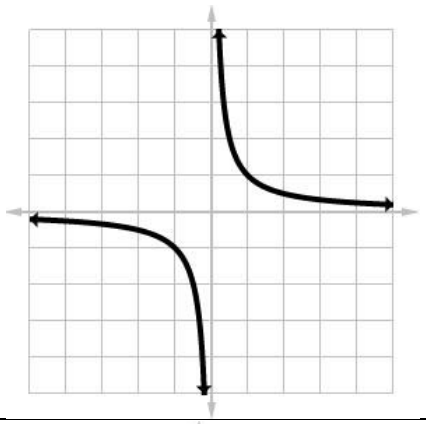
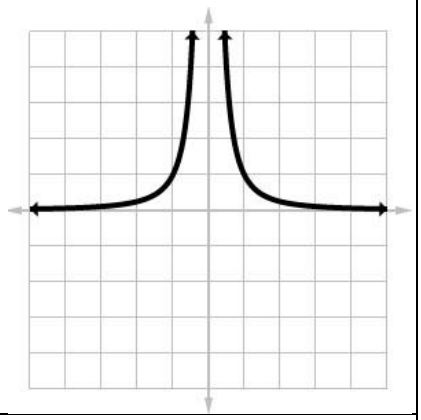
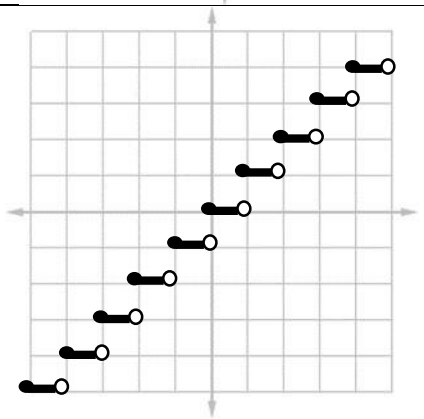
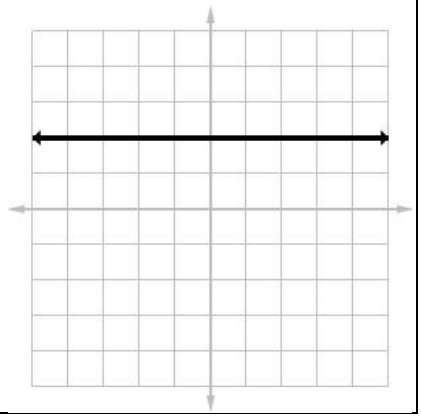
10 Basic Parent Functions

Parent Function	Graph		Graph
$y=x$ **Linear**, Odd **Domain:** $(-\infty,\infty)$ **Range:** $(-\infty,\infty)$ **End Behavior:** $x \to -\infty, y \to -\infty$ $x \to \infty, y \to \infty$ **Critical points:** $(-1,-1), (0,0), (1,1)$		$y = \lvert x \rvert$ **Absolute Value**, Even **Domain:** $(-\infty,\infty)$ **Range:** $[0,\infty)$ **End Behavior:** $x \to -\infty, y \to \infty$ $x \to \infty, y \to \infty$ **Critical points:** $(-1,1), (0,0), (1,1)$	
$y=x^2$ **Quadratic**, Even Domain: $(-\infty,\infty)$ Range: $[0,\infty)$ End Behavior: $x \to -\infty, y \to \infty$ $x \to \infty, y \to \infty$ Critical points: $(-1,1), (0,0), (1,1)$		$y = \sqrt{x}$ **Radical**, Neither (Square Root) Domain: $[0,\infty)$ Range: $[0,\infty)$ End Behavior: $x \to 0, y \to 0$ $x \to \infty, y \to \infty$ Critical points: $(0,0), (1,1), (4,2)$	
$y=x^3$ **Cubic**, Odd Domain: $(-\infty,\infty)$ Range: $(-\infty,\infty)$ End Behavior: $x \to -\infty, y \to -\infty$ $x \to \infty, y \to \infty$ Critical points: $(-1,-1), (0,0), (1,1)$		$y = \sqrt[3]{x}$ **Cube Root**, Odd Domain: $(-\infty,\infty)$ Range: $(-\infty,\infty)$ End Behavior: $x \to -\infty, y \to -\infty$ $x \to \infty, y \to \infty$ Critical points: $(-1,-1), (0,0), (1,1)$	

Parent Function	Graph	Parent Function	Graph
$y = b^x$, $b > 1$ $(y = 2^x)$ **Exponential**, Neither Domain: $(-\infty,\infty)$ Range: $(0,\infty)$ End Behavior: $x \to -\infty$, $y \to 0$ $x \to \infty$, $y \to \infty$ Critical points: $(-1, \frac{1}{b})$, $(0,1)$, $(1,b)$ Asymptote: $y = 0$		$y = \log_b x$, $b > 1$ $(y = \log_2 x)$ **Log**, Neither Domain: $(0,\infty)$ Range: $(-\infty,\infty)$ End Behavior: $x \to 0^+$, $y \to -\infty$ $x \to \infty$, $y \to \infty$ Critical points: $(\frac{1}{b}, -1)$, $(1,0)$, $(b,1)$ Asymptote: $x = 0$	
$y = \frac{1}{x}$ **Rational,** Odd (Inverse) **Domain:** $(-\infty,0) \cup (0,\infty)$ **Range:** $(-\infty,0) \cup (0,\infty)$ **End Behavior:** $x \to -\infty$, $y \to 0$ $x \to \infty$, $y \to 0$ **Critical points:** $(-1,-1)$, $(1,1)$ **Asymptotes:** $y = 0$, $x = 0$		$y = \frac{1}{x^2}$ **Rational,** Even (Inverse Squared) **Domain:** $(-\infty,0) \cup (0,\infty)$ **Range:** $(0,\infty)$ **End Behavior:** $x \to -\infty$, $y \to 0$ $x \to \infty$, $y \to 0$ **Critical points:** $(-1,1)$, $(1,1)$ **Asymptotes:** $x = 0$, $y = 0$	
$y = \text{int}(x) = [\![x]\!]$ **Greatest Integer**, Neither **Domain:** $(-\infty,\infty)$ **Range:** $\{y: y \in Z\}$ (Z = integers) **End Behavior:** $x \to -\infty$, $y \to -\infty$ $x \to \infty$, $y \to \infty$ **Critical points:** $x : [-1,0)$ $y : -1$ $x : [0,1)$ $y : 0$ $x : [1,2)$ $y : 1$		$y = C$ $(y = 2)$ **Constant**, Even **Domain:** $(-\infty,\infty)$ **Range:** $\{y: y = C\}$ **End Behavior:** $x \to -\infty$, $y \to C$ $x \to \infty$, $y \to C$ **Critical points:** $(-1,C)$, $(0,C)$, $(1,C)$	

Transformation Rules

Vertical Shift g(x) = f(x) – c	g(x) = f(x) + c shifts down	shifts up
Horizontal Shift g(x) = f(x – c)	g(x) = f(x + c) shifts right	shifts left
Reflections	g(x) = - f(x) g(x) = f(- x)	flips over the x flips over the y
Vertical Stretch or Compression	g(x) = c f(x)	if c > 1 stretches vertically if 0 < c < 1 compresses vertically
Horizontal Stretch or Compression	g(x) = f(cx)	if c > 1 compresses horizontally if 0 < c < 1 stretches horizontally