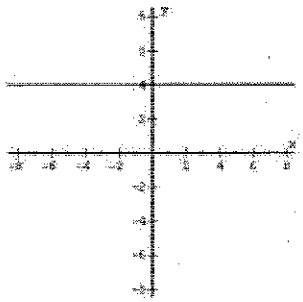
Parent Functions Guide: PreCalculus Name: Key

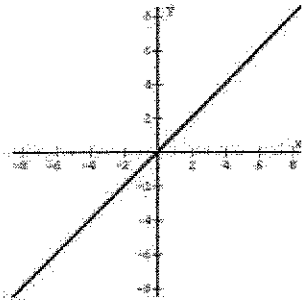
Directions: For each parent function, find the domain, range, intercepts, symmetry (and if its odd/even function), continuity, end behavior, and intervals on which the graph is increasing/decreasing.



$f(x) = a$

Constant

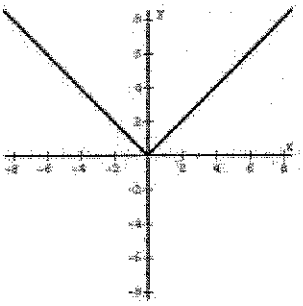
D: $(-\infty, \infty)$
R: $[a]$
x-int: $\varnothing$ y-int: $(0,a)$
Symmetry: over y-axis (even)
Continuous? Yes
End Behavior:
$\lim_{x \to -\infty} f(x) = a$
$\lim_{x \to \infty} f(x) = a$
Constant: $(-\infty, \infty)$



$f(x) = x$

Linear

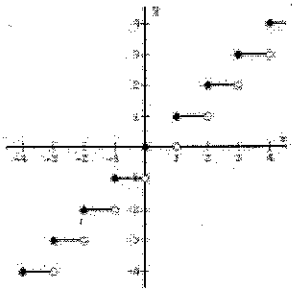
D: $(-\infty, \infty)$
R: $(-\infty, \infty)$
x-int: $(0,0)$ y-int: $(0,0)$
Symmetry: over origin (odd)
Continuous? Yes
End Behavior:
$\lim_{x \to -\infty} f(x) = -\infty$
$\lim_{x \to \infty} f(x) = \infty$
Increasing: $(-\infty, \infty)$



$f(x) = |x|$

Absolute Value

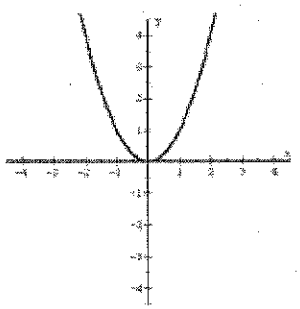
D: $(-\infty, \infty)$
R: $(0, \infty)$
x-int: $(0,0)$ y-int: $(0,0)$
Symmetry: over y-axis (even)
Continuous? Yes
End Behavior:
$\lim_{x \to -\infty} f(x) = \infty$ $\lim_{x \to \infty} f(x) = \infty$
Increasing: $(0, \infty)$
Decreasing: $(-\infty, 0)$



$f(x) = \text{int}(x) = [x]$

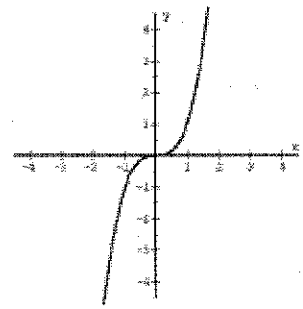
Greatest Integer

D: $(-\infty, \infty)$
R: $\{x \mid x \in \mathbb{Z}\}$
x-int: $(0,0)$ y-int: $(0,0)$
Symmetry: none
Continuous? No (jump discont.)
End Behavior:
$\lim_{x \to -\infty} f(x) = -\infty$ $\lim_{x \to \infty} f(x) = \infty$
Constant between jumps



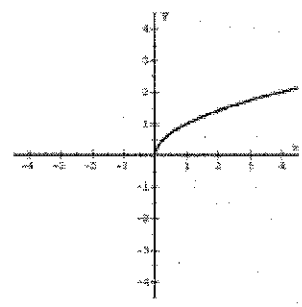
$f(x) = x^2$

Quadratic



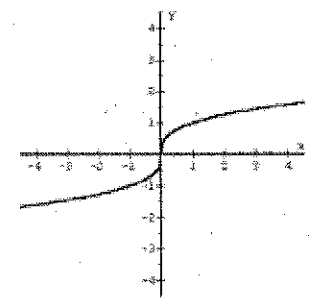
$f(x) = x^3$

Cubic



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

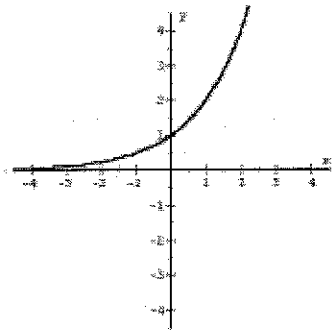
Square Root



$f(x) = \sqrt[3]{x}$

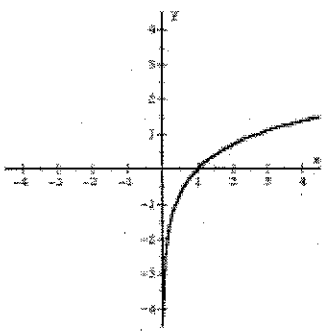
Cube Root

Quadratic	Cubic	Square Root	Cube root
D: $(-\infty,\infty)$ R: $(0,\infty)$ x-int: (0,0) y-int: (0,0) Symmetry: over y-axis (even) Continuity?: yes End Behavior: $\lim_{x\to-\infty} f(x)=\infty$ $\lim_{x\to\infty} f(x)=\infty$ Decreasing from $(-\infty,0)$ Increasing from $(0,\infty)$	D: $(-\infty,\infty)$ R: $(-\infty,\infty)$ x-int: (0,0) y-int: (0,0) Symmetry: over origin (odd) Continuity?: Yes End Behavior: $\lim_{x\to-\infty} f(x)=-\infty$ $\lim_{x\to\infty} f(x)=\infty$ Increasing from $(-\infty,\infty)$	D: $(0,\infty)$ R: $(0,\infty)$ x-int: (0,0) y-int: (0,0) Symmetry: none Continuity: Yes End Behavior: $\lim_{x\to-\infty} f(x)=0$ $\lim_{x\to\infty} f(x)=\infty$ Increasing from $(0,\infty)$	D: $(-\infty,\infty)$ R: $(-\infty,\infty)$ x-int: (0,0) y-int: (0,0) Symmetry: about the origin (odd) Continuity: Yes End Behavior: $\lim_{x\to-\infty} f(x)=-\infty$ $\lim_{x\to\infty} f(x)=\infty$ Increasing from $(-\infty,\infty)$



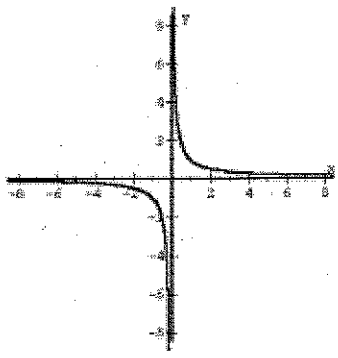
$f(x) = a^x$

Exponential



$f(x) = \log_a x$

Logarithmic



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

Reciprocal

D: $(-\infty,\infty)$ R: $(0,\infty)$ x-int: $\emptyset$ y-int: $(0,a)$ Symmetry: None Continuity: Yes End Behavior: $\lim_{x\to-\infty} f(x)=0$ $\lim_{x\to\infty} f(x)=\infty$ Increasing $(-\infty,\infty)$	D: $(0,\infty)$ R: $(-\infty,\infty)$ x-int: (0,a) y-int: $\emptyset$ Symmetry: none Continuity: Yes End Behavior: $\lim_{x\to-\infty} f(x)=-\infty$ $\lim_{x\to\infty} f(x)=\infty$ Increasing $(0,\infty)$	D: $(-\infty,0)\cup(0,\infty)$ x-int: 0 R: $(-\infty,0)\cup(0,\infty)$ y-int: 0 Symmetry: about the origin (odd) Continuity: No; infinite discontinuity at $x=0$ End Behavior: $\lim_{x\to-\infty} f(x)=0$ $\lim_{x\to\infty} f(x)=0$ Decreasing $(-\infty,0)\cup(0,\infty)$