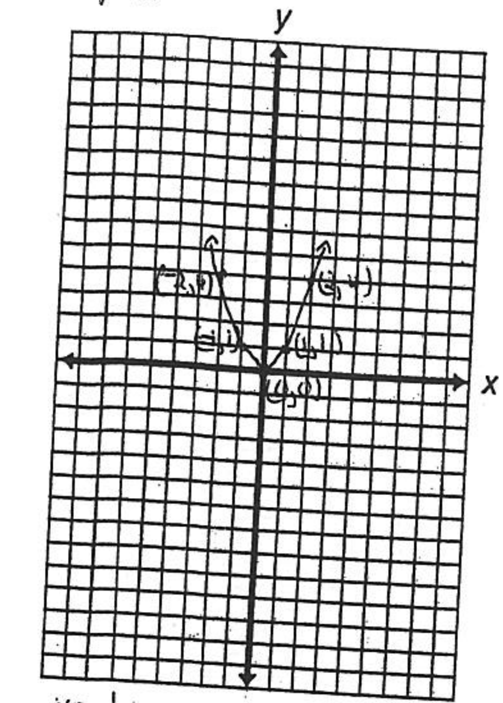
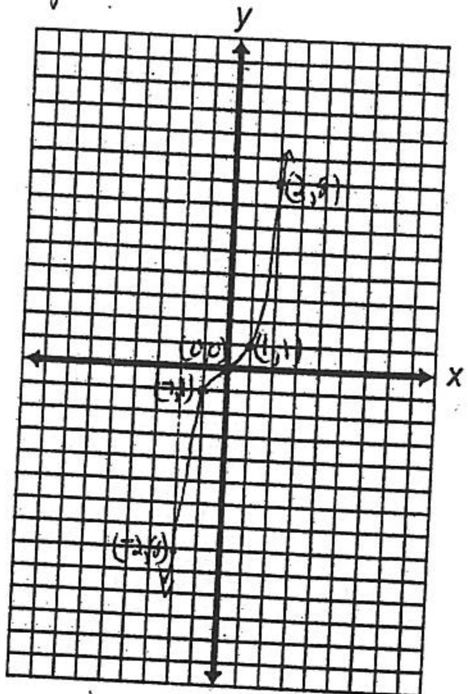
Library of Basic Graphs

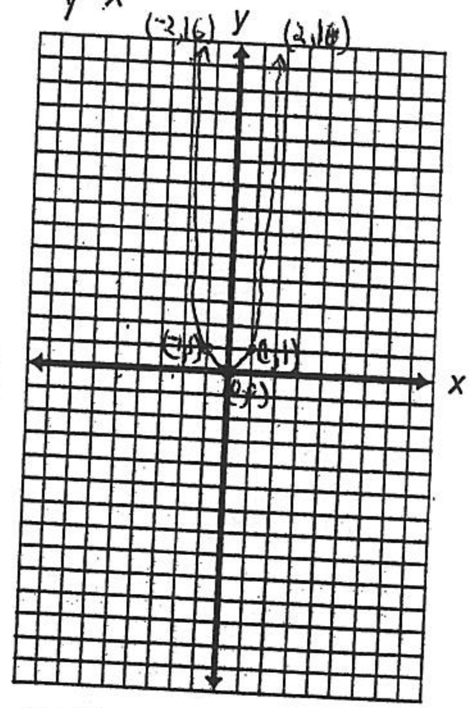
$y = x^2$



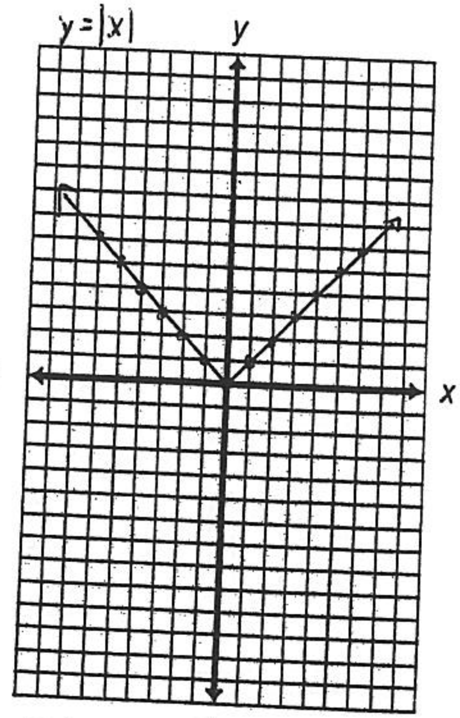
$y = x^3$



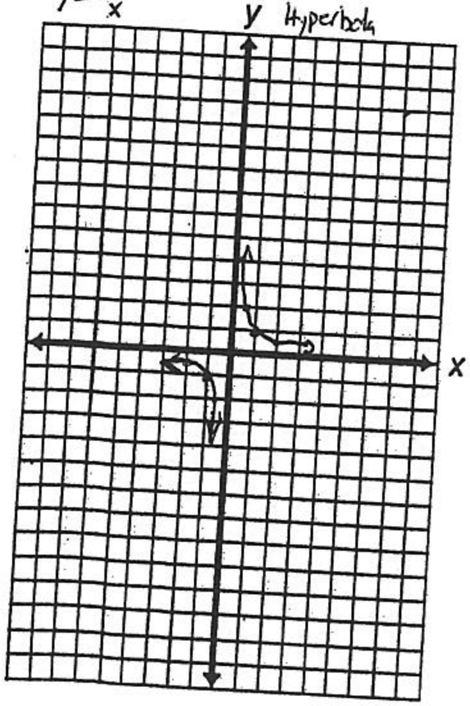
$y = x^4$



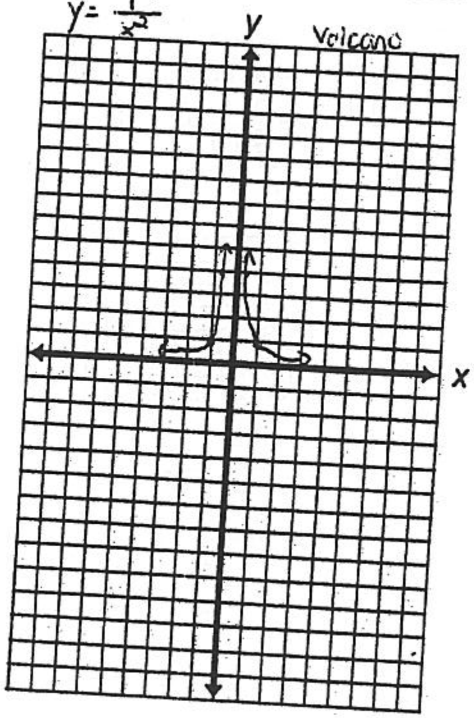
$y = |x|$



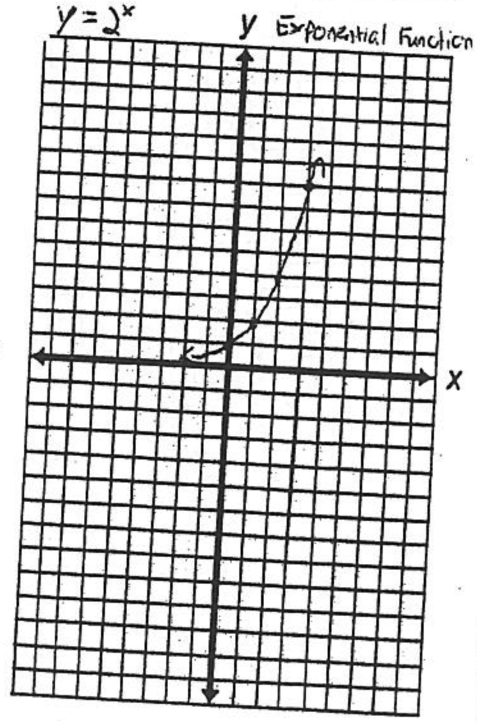
$y = \frac{1}{x}$ Hyperbola



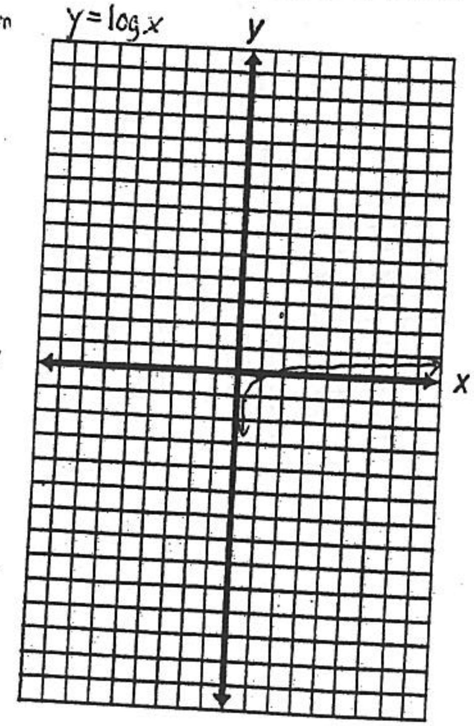
$y = \frac{1}{x^2}$ Volcano



$y = 2^x$ Exponential Function



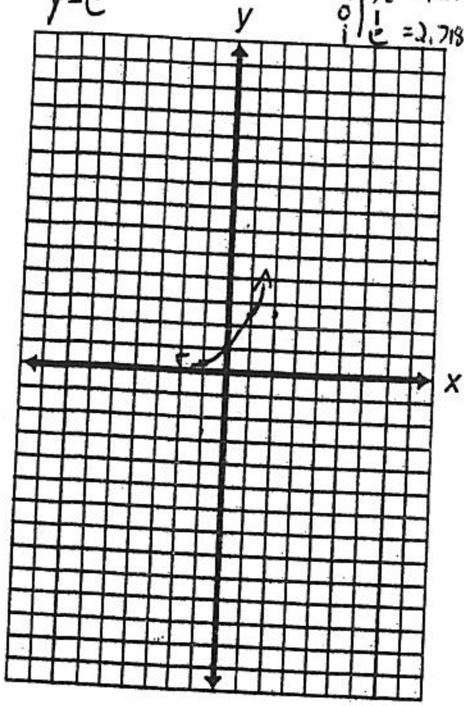
$y = \log x$



Library of Basic Graphs

$y=e^x$

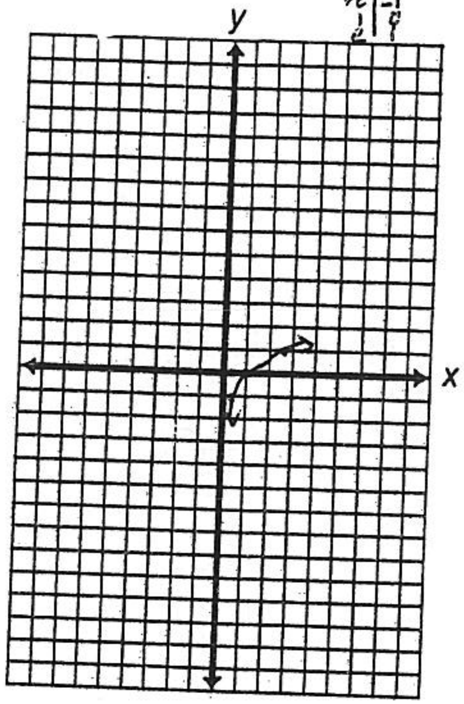
x	y
-1	$1/e$ $=.367$
0	1
1	e $=2.718$



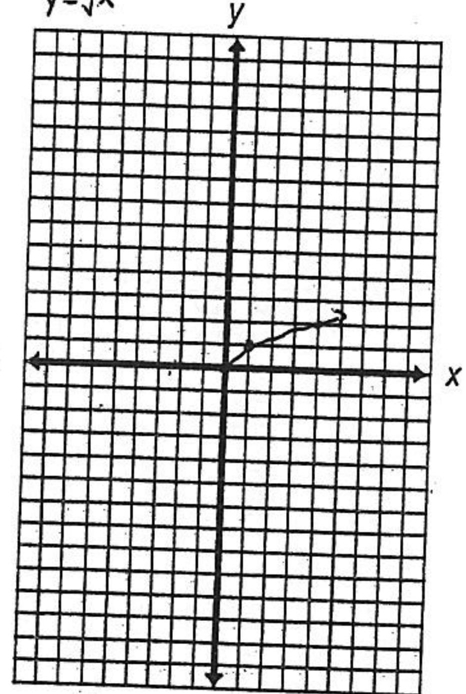
$y=\ln x$

$x=e^y$

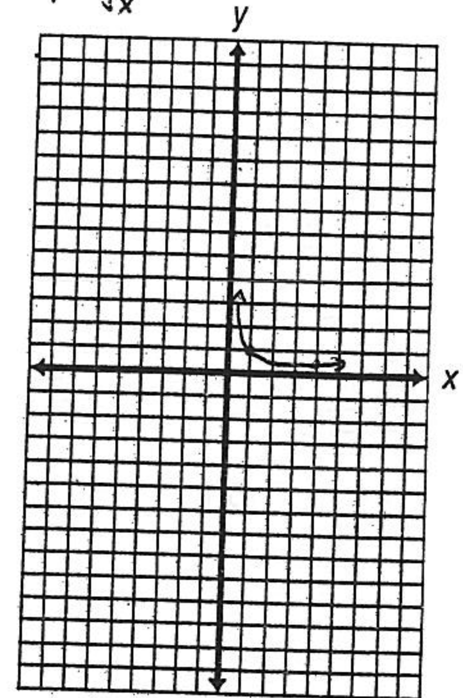
x	y
$1/e$	-1
1	0
e	1

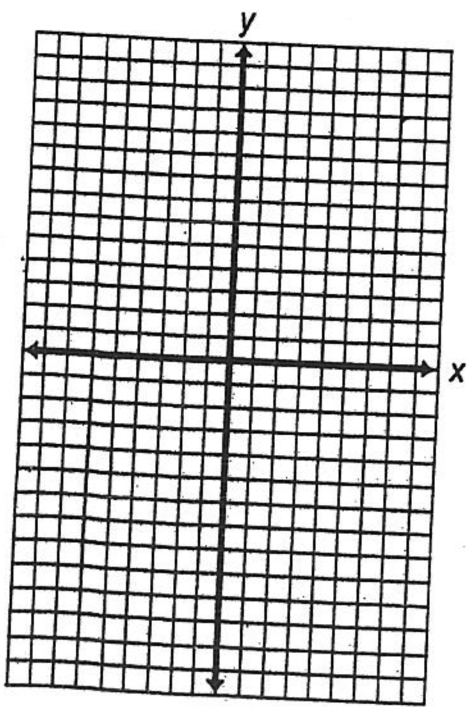


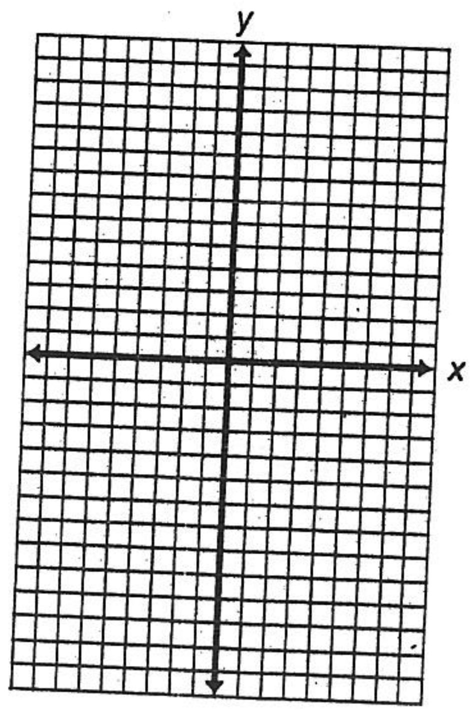
$y=\sqrt{x}$



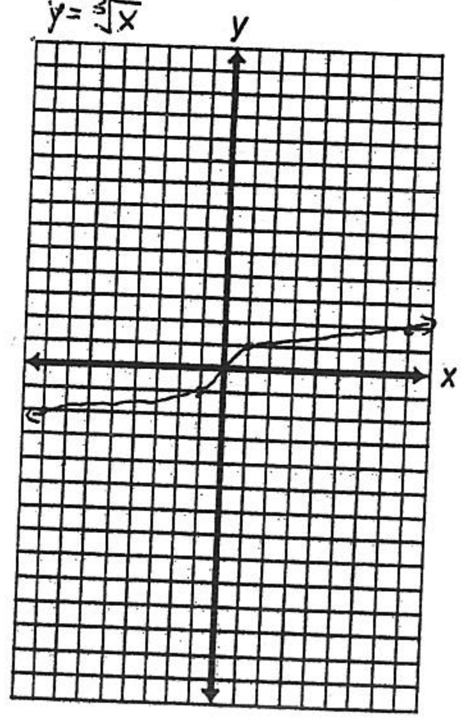
$y=\frac{1}{\sqrt{x}}$



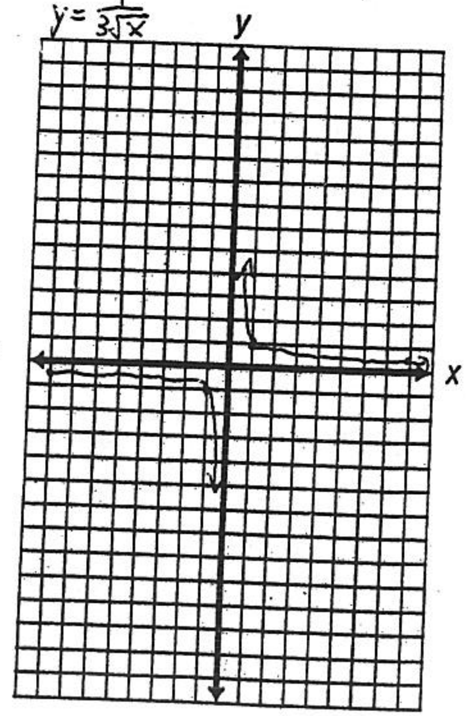




$y=\sqrt[3]{x}$



$y=\frac{1}{\sqrt[3]{x}}$



DISTANCE AND MIDPOINT FORMULAS

Distance between $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Midpoint of P_1P_2: $\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

LINES

Slope of line through $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$ $\qquad m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Point-slope equation of line through $P_1(x_1, y_1)$ with slope m $\qquad y - y_1 = m(x - x_1)$

Slope-intercept equation of line with slope m and y-intercept b $\qquad y = mx + b$

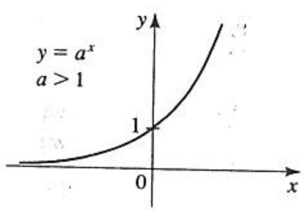
Two-intercept equation of line with x-intercept a and y-intercept b $\qquad \dfrac{x}{a} + \dfrac{y}{b} = 1$

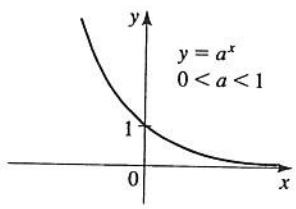
LOGARITHMS

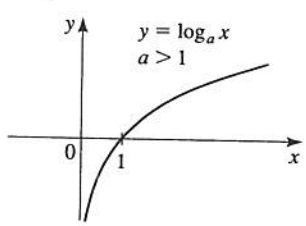
$y = \log_a x$ means $a^y = x$

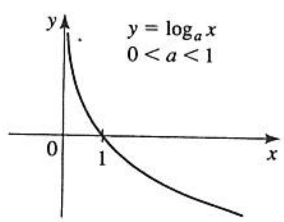
$\log_a a^x = x$	$a^{\log_a x} = x$
$\log_a 1 = 0$	$\log_a a = 1$
$\log x = \log_{10} x$	$\ln x = \log_e x$
$\log_a xy = \log_a x + \log_a y$	$\log_a\left(\dfrac{x}{y}\right) = \log_a x - \log_a y$
$\log_a x^b = b \log_a x$	$\log_b x = \dfrac{\log_a x}{\log_a b}$

EXPONENTIAL AND LOGARITHMIC FUNCTIONS









GRAPHS OF FUNCTIONS

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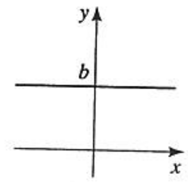
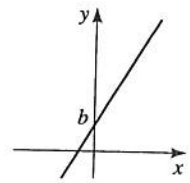
Linear functions: $f(x) = mx + b$

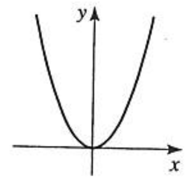


$f(x) = b$

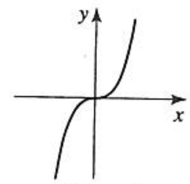


$f(x) = mx + b$

Power functions: $f(x) = x^n$

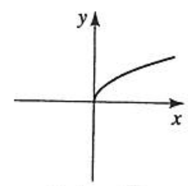


$f(x) = x^2$

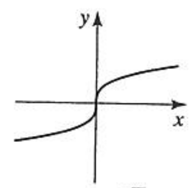


$f(x) = x^3$

Root functions: $f(x) = \sqrt[n]{x}$

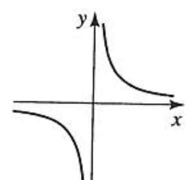


$f(x) = \sqrt{x}$

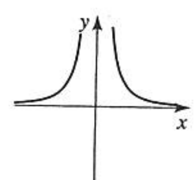


$f(x) = \sqrt[3]{x}$

Reciprocal functions: $f(x) = 1/x^n$

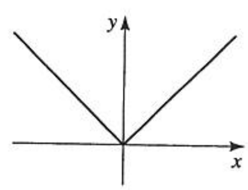


$f(x) = \dfrac{1}{x}$



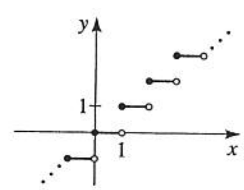
$f(x) = \dfrac{1}{x^2}$

Absolute value function



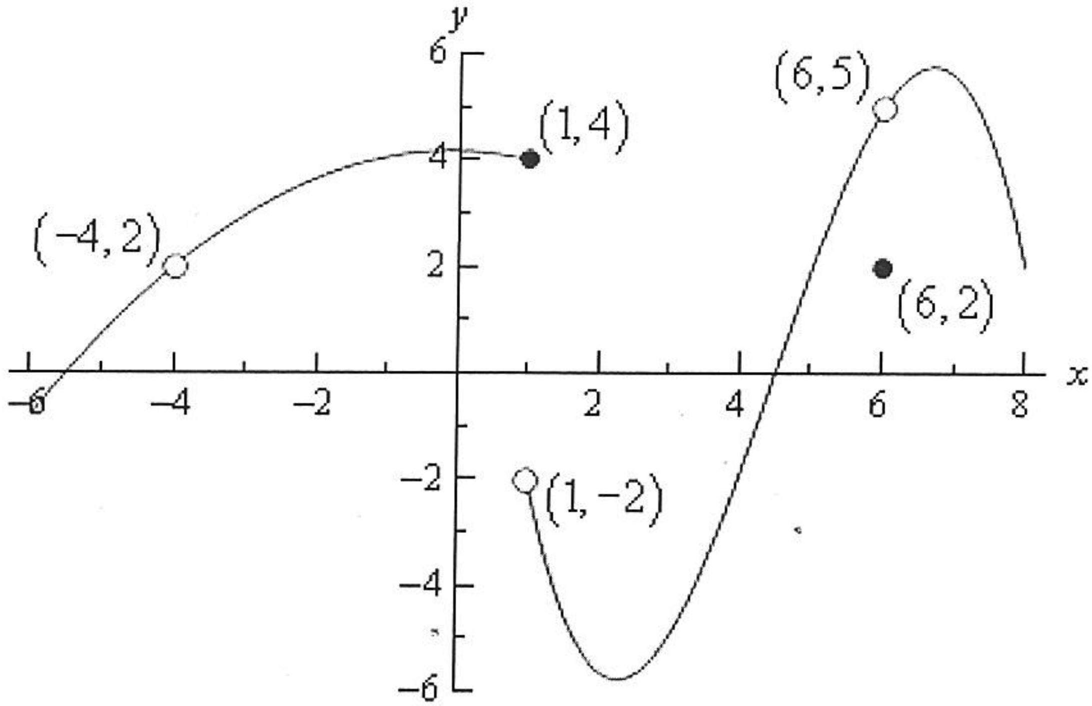
$f(x) = |x|$

Greatest integer function



$f(x) = [\![x]\!]$

Given the following graph,



compute each of the following.

(a) $f(-4)$ not defined **(b)** $\lim_{x\to -4^-} f(x)$ 2 **(c)** $\lim_{x\to -4^+} f(x)$ 2 **(d)** $\lim_{x\to -4} f(x)$ 2

(e) $f(1)$ 4 **(f)** $\lim_{x\to 1^-} f(x)$ 4 **(g)** $\lim_{x\to 1^+} f(x)$ -2 **(h)** $\lim_{x\to 1} f(x)$ dne

(i) $f(6)$ 2 **(j)** $\lim_{x\to 6^-} f(x)$ 5 **(k)** $\lim_{x\to 6^+} f(x)$ 5 **(l)** $\lim_{x\to 6} f(x)$ 5

Name:____ Date:________

AP Calculus Ms. Loughran

THEOREM. *Let* lim *stand for one of the limits* $\lim_{x\to a}$, $\lim_{x\to a^-}$, $\lim_{x\to a^+}$, $\lim_{x\to +\infty}$, *or* $\lim_{x\to -\infty}$. *If* $L_1 = \lim f(x)$ *and* $L_2 = \lim g(x)$ *both exist, then*

(*a*) $\lim [f(x) + g(x)] = \lim f(x) + \lim g(x) = L_1 + L_2$

(*b*) $\lim [f(x) - g(x)] = \lim f(x) - \lim g(x) = L_1 - L_2$

(*c*) $\lim [f(x)g(x)] = \lim f(x) \lim g(x) = L_1 L_2$

(*d*) $\lim \dfrac{f(x)}{g(x)} = \dfrac{\lim f(x)}{\lim g(x)} = \dfrac{L_1}{L_2}$ *if* $L_2 \neq 0$

(*e*) $\lim \sqrt[n]{f(x)} = \sqrt[n]{\lim f(x)} = \sqrt[n]{L_1}$ *provided* $L_1 \geq 0$ *if* n *is even.*

In words, this theorem states:

(*a*) *The limit of a sum is the sum of the limits.*

(*b*) *The limit of a difference is the difference of the limits.*

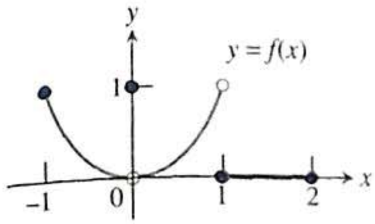
(*c*) *The limit of a product is the product of the limits.*

(*d*) *The limit of a quotient is the quotient of the limits provided the limit of the denominator is not zero.*

(*e*) *The limit of an nth root is the nth root of the limits.*

Finding Limits Graphically

For # 1 – 2, tell whether the statements are true or false.



(a) $\lim_{x \to -1^+} f(x) = 1$ T

(b) $\lim_{x \to 0^-} f(x) = 0$ T

(c) $\lim_{x \to 0^-} f(x) = 1$ F

(d) $\lim_{x \to 0^-} f(x) = \lim_{x \to 0^+} f(x)$ T

(e) $\lim_{x \to 0} f(x)$ exists T

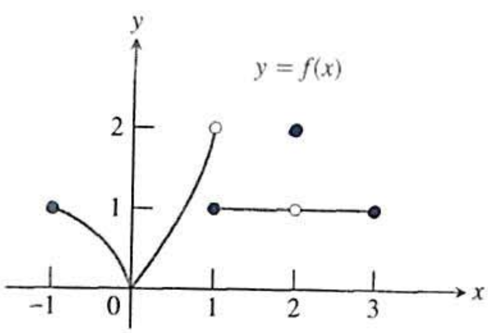
(f) $\lim_{x \to 0} f(x) = 0$ T

(g) $\lim_{x \to 0} f(x) = 1$ F

(h) $\lim_{x \to 1} f(x) = 1$ F

(i) $\lim_{x \to 1} f(x) = 0$ F

(j) $\lim_{x \to 2^-} f(x) = 2$ F



(a) $\lim_{x \to -1^+} f(x) = 1$ T

(b) $\lim_{x \to 2} f(x)$ does not exist. False

(c) $\lim_{x \to 2} f(x) = 2$ F

(d) $\lim_{x \to 1^-} f(x) = 2$ T

(e) $\lim_{x \to 1^+} f(x) = 1$ T

(f) $\lim_{x \to 1} f(x)$ does not exist. T

(g) $\lim_{x \to 0^+} f(x) = \lim_{x \to 0^-} f(x)$ T

(h) $\lim_{x \to c} f(x)$ exists at every c in $(-1, 1)$. T

(i) $\lim_{x \to c} f(x)$ exists at every c in $(1, 3)$. T