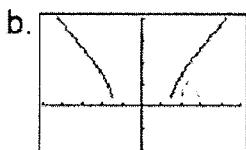


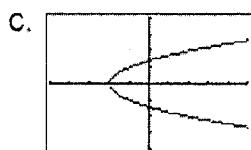
- ✓ 1. Determine which of the following are functions, have inverse functions, and are one-to-one.



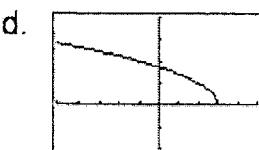
yes; yes; no



yes; no; no



no; yes; no



yes; yes; yes

- ✓ 2. Find two functions defined implicitly by each given relation:

a) $x^2 + 7 = y^2$

$$y = \pm \sqrt{x^2 + 7}$$

b) $9y^2 - 12xy + 4x^2 = 49$

$$y = \frac{2}{3}x + \frac{7}{3}, \quad y = \frac{2}{3}x - \frac{7}{3}$$

- ✓ 3. Write an equation for each situation described below:

- a) the squaring function is reflected over the x-axis and translated up 3 and left 2.

$$f(x) = -(x+2)^2 + 3$$

- b) the logistic function vertically stretched by 3 and reflected over the y-axis

$$f(x) = \frac{3}{1+e^{-x}}$$

- c) the square root function is horizontally shrunk by a factor of $\frac{3}{4}$ and translated right 6 spaces

$$f(x) = \sqrt{\frac{4}{3}(x-6)}$$

- ✓ 4. Determine algebraically whether the function is even, odd, or neither.

a) $f(x) = x + 7$

neither

b) $f(x) = x^2 - 8x + 3$

neither

c) $f(x) = x^3 - 2x$

odd

d) $f(x) = 3x^3 - x - 8$

e) $f(x) = 5x^2 + 2$

f) $f(x) = 5x^4 - 2x^2 + 1$

neither

even

even

- ✓ 5. Given $f(x) = 3x - 2$ and $g(x) = x^2 - 2x + 7$. Evaluate and then state the domain.

* domain is $(-\infty, \infty)$ for a-d

a) $(f+g)(x)$

b) $f(x) \cdot g(x)$

c) $(f \circ g)(x)$

d) $g(f(x))$

$$x^2 + x + 5$$

$$3x^3 - 8x^2 + 25x - 14$$

$$3x^2 - 6x + 19$$

$$9x^2 - 18x + 15$$

6. Decompose the following functions. Write each given function as the composite of two functions, neither of which is the identity function.

a) $f(x) = \sqrt[3]{x^2 + 2}$

b) $g(x) = \sqrt{x+3} - \sqrt[3]{x+3}$

composition $p(g(x))$

$$q(x) = x^2 + 2$$

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

$$q(x) = x + 3$$

$$p(x) = \sqrt{x - 3}$$

$$43$$

7. Find the inverse of each function. Give the domain of the inverse, including any restrictions inherited from f .

a) $f(x) = \frac{x-3}{x-2}$ D: $(-\infty, 1) \cup (1, \infty)$

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

$$D: [6, \infty)$$

$$f^{-1}(x) = \pm \sqrt{x-6}$$

8. Verify algebraically that the following functions are inverses of one another:

a) $f(x) = \frac{1}{x+1}$ and $g(x) = \frac{1-x}{x}$

$$f(g(x)) = \frac{(1)x}{(1-x+1)x} = \frac{x}{1-x+x} = \frac{x}{1} = x$$

a) $f(x) = 2x - 6$ and $g(x) = \frac{x}{2} + 3$

$$g(f(x)) = \frac{\left(\frac{x}{2}+3\right)}{\left(\frac{1}{x+1}\right)} = \frac{x+6}{1} = \frac{x}{1} = x$$

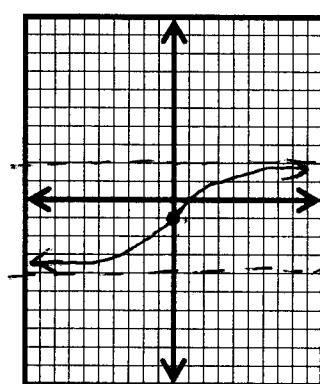
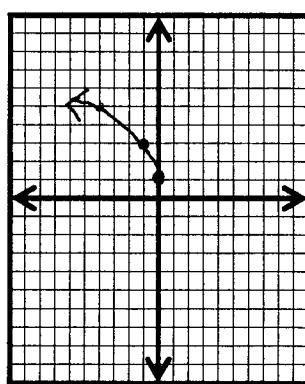
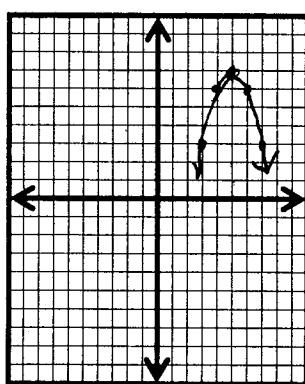
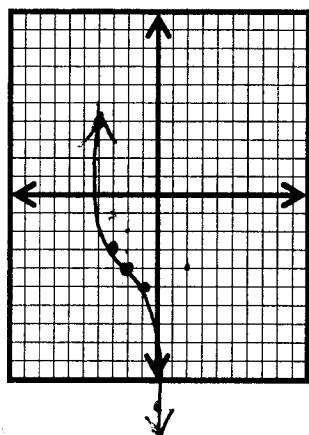
$$f(g(x)) = 2\left(\frac{x}{2}+3\right)-6 = x+6-6 = x \quad g(f(x)) = \frac{2x-6}{2} + 3 = x-3+3 = x$$

9. Sketch each of the following functions IN ORDER TO answer the questions below:

$$f(x) = (-x-2)^3 - 4$$

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

$$\left(-\frac{(x+2)}{3}-4\right)$$



A) Which function(s) above is bounded above? bounded below? bounded? unbounded?

$g(x)$

$h(x)$

$j(x)$

$f(x)$

B) Determine the domain and range of each function above:

$f(x)$

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

$g(x)$

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

$h(x)$

D: $(-\infty, 0]$

$j(x)$

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

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

R: $(-\infty, 7]$

R: $[1, \infty)$

R: $(-4, 2)$

C) Determine the interval(s) over which the above functions are increasing and decreasing:

$f(x)$

$g(x)$

$h(x)$

$j(x)$

inc:

inc: $(-\infty, 5)$

inc:

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

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

dec: $(5, \infty)$

dec: $(-\infty, 0)$

dec:

D) Determine the absolute & local max & min(s) of the above functions:

$f(x)$

$g(x)$

$h(x)$

(y -values)

$j(x)$

Abs. Max: None

Abs. Max: 7

Abs. Max: None

Abs. Max: None

Abs. Min: None

Abs. Min: None

Abs. Min: 1

Abs. Min: None

Loc. Max: None

Loc. Max: 7

Loc. Max: None

Loc. Max: None

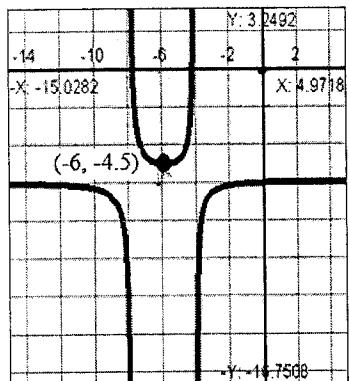
Loc. Min: None

Loc. Min: None

Loc. Min: 1

Loc. Min: None

- ✓ 10. Given the graph of a function, determine if it is continuous (if not, name the type of discontinuity). Find the equation of any horizontal or vertical asymptote. Determine the end behavior using limit notation, increasing/decreasing interval(s), domain/range, and max/min. Write "None" or "N/A" if something does not apply to that function.



Continuity: discontinuous at $x = -8 \notin x = -4$
(infinite)

Horizontal Asymptote: $y = -6$ (ish)
Vertical Asymptotes: $x = -8$ and $x = -4$
(could be $y = -5$ → $\lim_{x \rightarrow -4} f(x) = -6$)

Right End Behavior: $\lim_{x \rightarrow \infty} f(x) = -6$

Left End Behavior: $\lim_{x \rightarrow -\infty} f(x) = -6$

Increasing Interval(s): $(-6, -4) \cup (4, \infty)$ Decreasing Interval(s): $(-\infty, -8) \cup (-8, -6)$

Domain: $(-\infty, -8) \cup (-8, -4) \cup (-4, \infty)$ Range: $(-\infty, -6) \cup [4, \infty)$

Local Max: None Local Min: -4.5 (at $x = -6$)

Abs. Max: None

Abs. Min: None

11. Graph the piecewise function:

$$\begin{cases} |x+1|, & x < -1 \\ 3, & -1 \leq x \leq 4 \\ \frac{1}{2}x, & x > 4 \end{cases}$$

