Looking for Domains

(a) Nine of the functions have domain the set of all real numbers. Which three do not?

$$f(x) = \frac{1}{x} \qquad f(x) = \sqrt{x} \qquad f(x) = \ln x$$

(b) One of the functions has domain the set of all reals except 0. Which function is it, and why isn't zero in its domain?

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

(c) Which two functions have no negative numbers in their domains? Of these two, which one is defined at zero?

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

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

Looking for Continuity

Only two of twelve functions have points of discontinuity. Are these points in the domain of the function?

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

NO!

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

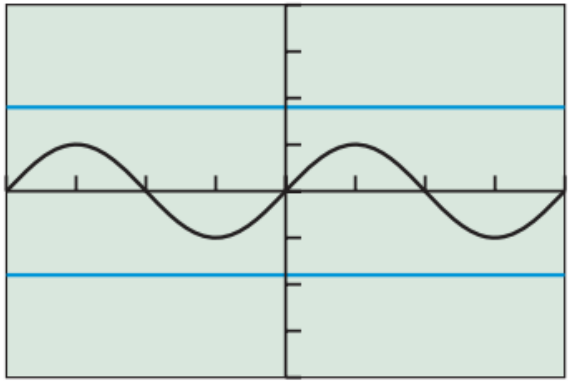
or

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

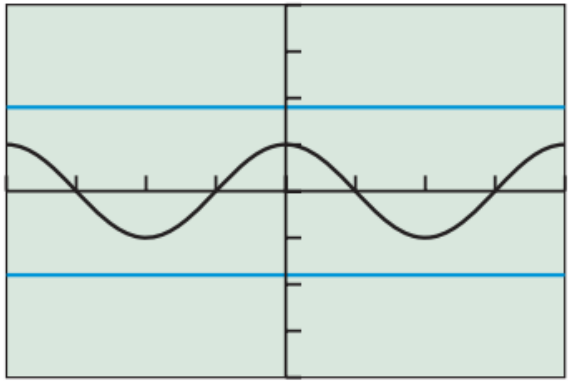
YES!

Looking for Boundedness

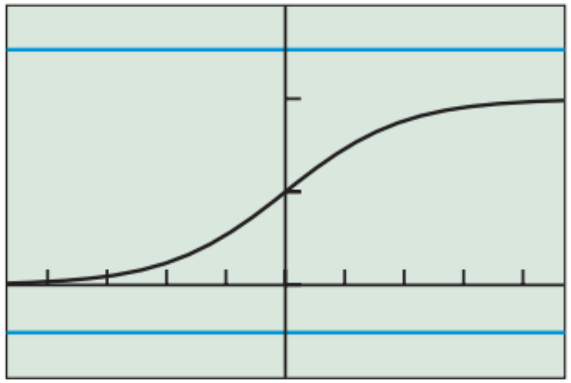
Only three of the twelve basic functions are bounded (above and below). Which three?



$f(x) = \sin x$



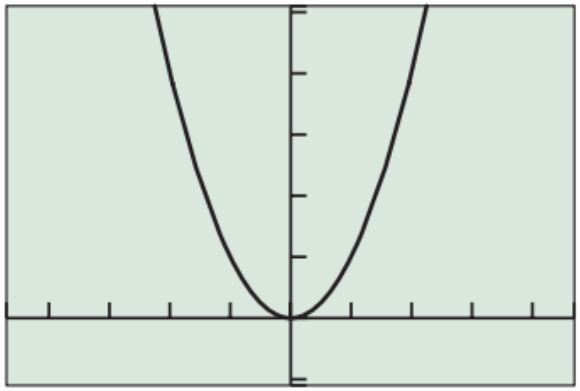
$f(x) = \cos x$



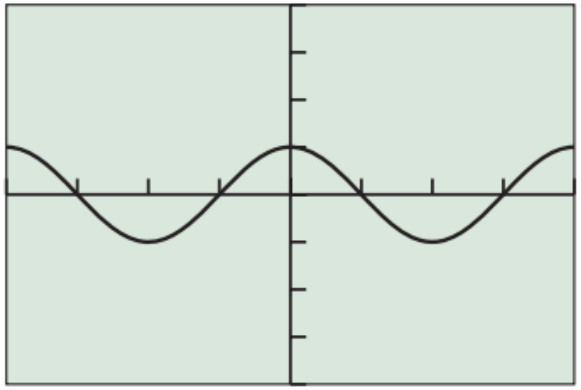
$f(x) = \dfrac{1}{1+e^{-x}}$

Looking for Symmetry

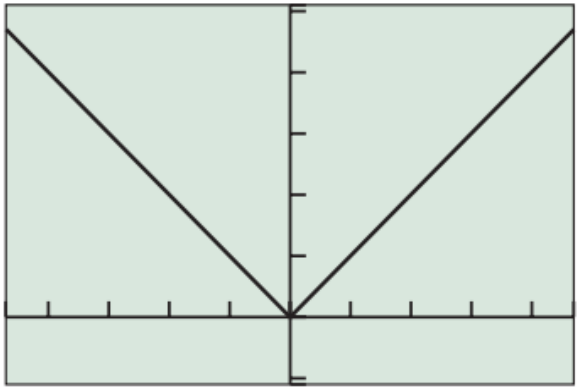
Three of the twelve basic functions are even. Which are they?



$f(x) = x^2$



$f(x) = \cos x$

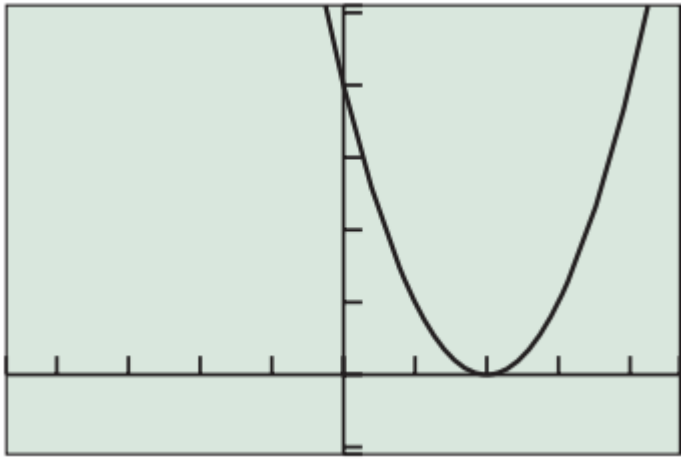


$f(x) = |x|$

Analyzing a Function Graphically

Graph the function $y = (x - 2)^2$. Then answer the following questions:

(a) On what interval is the function increasing? On what interval is it decreasing?



decreasing $(-\infty, 2]$

increasing $[2, \infty)$

(b) Is the function odd, even, or neither?

neither

(c) Does the function have any extrema?

absolute minimum @ (2, 0)

(d) How does the graph relate to the graph of the basic function $y = x^2$?

horizontal translation to the right 2

EXPLORATION 1 Looking for Asymptotes

1. Two of the basic functions have vertical asymptotes at $x = 0$. Which two?

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

2. Form a new function by adding these functions together. Does the new function have a vertical asymptote at $x = 0$? yes

3. Three of the basic functions have horizontal asymptotes at $y = 0$. Which three? $f(x) = \frac{1}{x}$ $f(x) = e^x$ $f(x) = \frac{1}{1+e^{-x}}$

4. Form a new function by adding these functions together. Does the new function have a horizontal asymptote at $y = 0$? yes

5. Graph $f(x) = 1/x$, $g(x) = 1/(2x^2 - x)$, and $h(x) = f(x) + g(x)$. Does $h(x)$ have a vertical asymptote at $x = 0$?

no, there is removable discontinuity @ $x = 0$