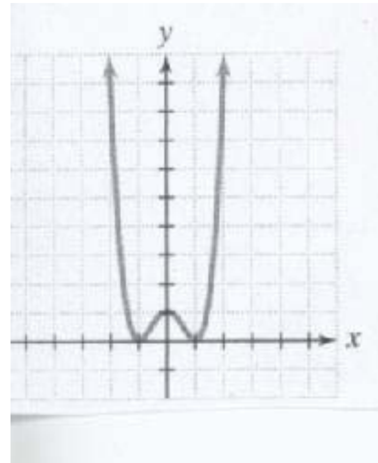
PRECALCULUS PROBLEM SESSION #1 - PRACTICE PROBLEMS

Functions and Their Graphs

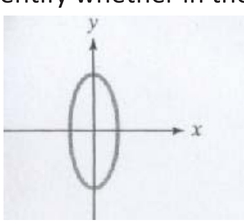
1. Graph the following equations using a table of values. Let x = -3, -2, -1, 0, 1, 2, and 3.
   a) $y = x^2 + 2$ b) $y = \frac{1}{2}x + 2$ c) $y = |x| - 1$

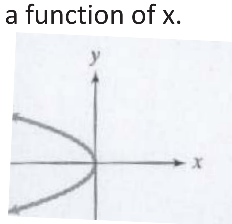
2. Use the graph to a) determine the x-intercepts if any, b) determine the y-intercepts, if any.



Introduction to Functions

1. Explain in your own words the difference between the domain of a function and the range of a function and then tell whether each relation is a function and give the domain and range.
   a. $\{(5,6), (5,7), (6,6), (6,7)\}$ b. $\{(10,4), (-2,4), (-1,1), (5,6)\}$

2. Explain why the vertical line test for determining if the graph of a relation is a function works. Then, use the vertical line test to identify whether in the graphs given y is a function of x.
   a)


   b)


3. Evaluate $g(x) = x^2 - 10x - 3$ at the given values of the independent variable and simplify.
   a) $g(-1)$ b) $g(x+2)$ c) $g(-x)$

4. Explain why a linear function *f(x) = mx + b* with $m \neq 0$ has exactly one zero.

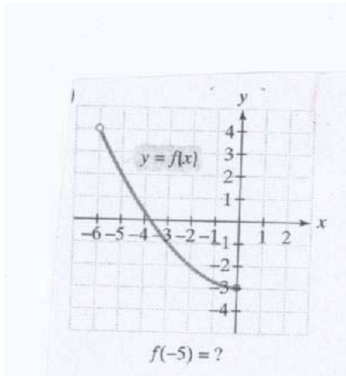
5. Is it ever true that for a function *f(a + b) = f(a) + f(b)?* If so, give an example of such *a* and *b*.

6. Determine whether each equation defines *y* as a function of *x*.
   a) $x^2 + y = 25$ b) $x^2 + y^2 = 25$ c) $x + y^3 = 27$

Selected problems were taken from Blitzer's PreCalculus

7. A car was purchased for $22,500. The value of the car decreased by $3200 per year for the first six years. Write a function that describes the value of the car, *V*, after *x* years, where $0 \leq x \leq 6$. Then find and interpret *V*(3).

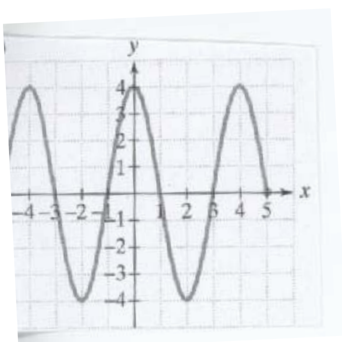
8. Use the graph to determine a) the function's domain, b) the function's range, c) the x-intercepts, d) the y-intercepts.

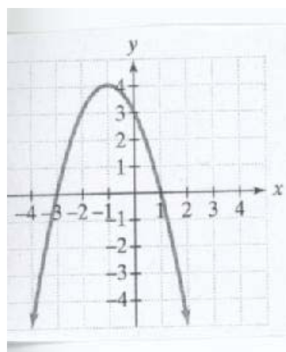


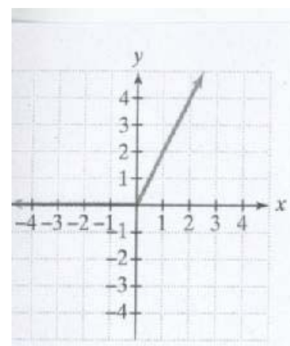
More on Functions and Graphs

1. Discuss why the graph of a vertical line *x* = *a* cannot represent y as a function of x.

2. Use the graphs to determine a) intervals on which the function is increasing, b) intervals on which the function is decreasing, c) intervals on which the function is constant.





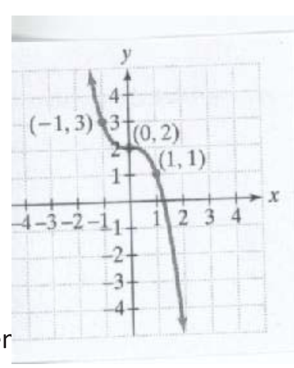


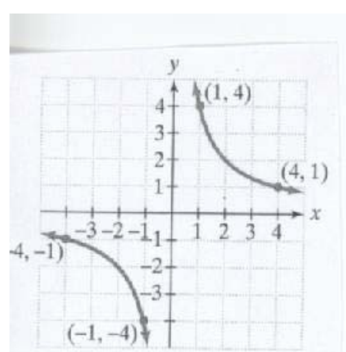
3. Consider the constant function *f(x)* = 0. Determine whether the graph of this function is symmetric with respect to the x-axis, the y-axis, and the origin. Determine whether this function is even or odd. In general, can a function be symmetric with respect to the x-axis?

4. Determine whether each function is even, odd, or neither.

   a. $g(x) = x^2 - x$ b. $f(x) = x^3 - x$ c. $h(x) = 2x^2 + x^4$

5. Use possible symmetry to determine whether each graph is the graph of an even function, an odd function, or a function that is neither even nor odd.





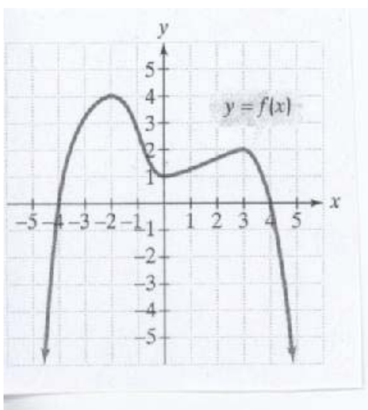
6. Graph each function and use your graph to determine the function's range.

a. $f(x) = \begin{cases} x+2, & x < -3 \\ x-2, & x \geq -3 \end{cases}$ b. $f(x) = \begin{cases} -x, & x < 0 \\ x, & x \geq 0 \end{cases}$ c. $f(x) = \begin{cases} -x & \text{if } x > 0 \\ x^2 & \text{if } -1 \leq x < 0 \\ 1 & \text{if } x < -1 \end{cases}$

7. Find and simplify the difference quotient $\frac{f(x+h)-f(x)}{h}, h \neq 0$

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

8. Use the graph of f to determine each of the following. Where applicable, use interval notation.



a) the domain of f
b) the range of f
c) the x − intercepts
d) the y −intercepts
e) intervals on which f is increasing
f) intervals on which f is decreasing
g) values of x for which $f(x) \leq 0$
h) the numbers at which f has a relative maximum
i) the relative maxima of f
j) the numbers at which f has a relative minimum
k) the relative minimum of f
l) $f(-2)$
m) the values of x for which $f(x) = 0$
n) Is f even, odd, or neither?

9. Describe a real-world situation that could be modeled by a function that is, in turn, increasing, then constant, and finally decreasing.

Selected problems were taken from Blitzer's <u>PreCalculus</u>