ANATOMY OF A FUNCTION

On your own notebook paper do:

INVESTIGATION ONE:

Given the graph of $f(x)$, answer the following. Unless otherwise specified restrict the domain of the function to the interval $[-6,7]$. Approximations are appropriate answers.

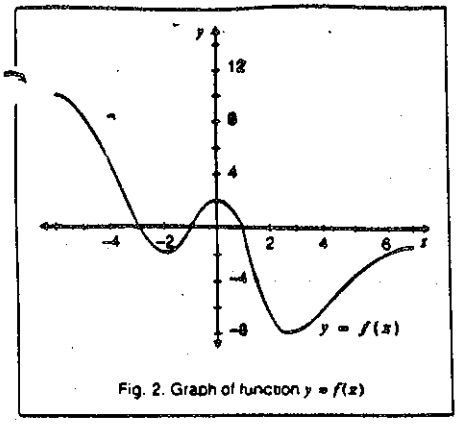


Fig. 2. Graph of function $y = f(x)$

a) What is $f(2)$?
b) For what values, if any, does, $f(x)=3$?
c) Give one root of $f(t)$?
d) What is the solution set of $f(x)>0$?
e) What is $f(f(2))$?
f) On what intervals is $f(x)>5$?
g) On what intervals is $f(x)$ increasing ?
h) On what intervals is the rate of increase of $f(x)$ decreasing ?
i) For what values, if any, does $f(x)=x$?
j) What do you think is a reasonable way to continue the graph past $x=7$? On the basis of your continuation, what is $f(10)$?

INVESTIGATION TWO:

Given the graph of the temperature range (in Celsius) for February 3rd, answer the following. Approximations are appropriate answers.

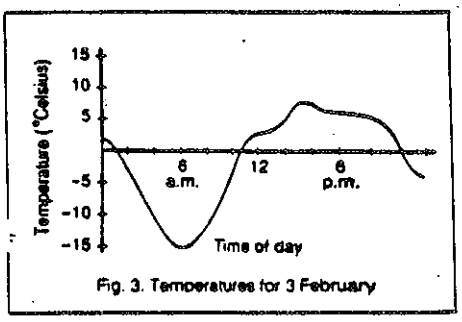


Fig. 3. Temperatures for 3 February

a) What was the temperature at 3:00 P.M.?
b) At what times, if any, was the temperature 15 degrees?
c) On what time spans, if any, was the temperature freezing ?
d) On what time spans, if any was the temperature rising?

INVESTIGATION THREE:

Given the graph at which tension levels does the heart rate of males increase at a greater rate than that of females?

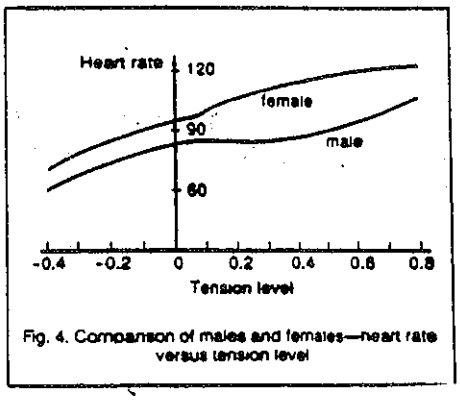


Fig. 4. Comparison of males and females—heart rate versus tension level

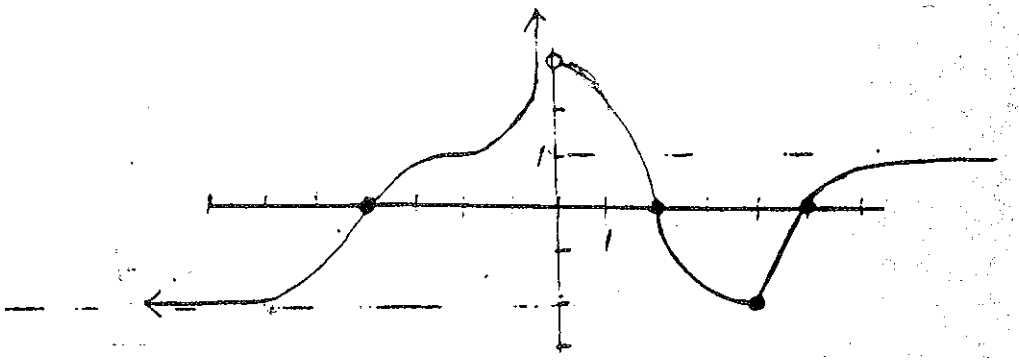
On your own notebook paper do:

1. State the domain of each function using the algebraic techniques from classnotes.
   a. $y=\frac{1}{x-11}$
   b. $y=\frac{x+2}{x^2-3x+2}$
   c. $y=\sqrt{3-x}$
   d. $y=\sqrt{x^2-5x-14}$
   e. $y=\sqrt{2x-7}$
   f. $y=\frac{1}{\sqrt{t^2-4}}$
   g. $y=\sqrt{\frac{1-x}{x+1}}$
   h. $y=\sqrt{x^2-9}$

2. Performing an autopsy on a function:

   Let $k(x)$ be the function with the following graph:

   a. For what approximate x-value(s) is $k(x)=0$?
   b. For what approximate x-value(s) is $k(x)=-2$?
   c. What approximate $k(x)$-values(s) is $k(-2)$?
   d. For what approximate x-values(s) is $k(x)>0$?
   e. On which interval(s) of x is k(x) increasing?
   f. On which interval(s) of x is k(x) concave down?
   g. What are the turning points, if any?
   h. State the domain and range.



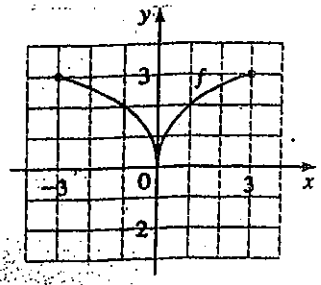
3. The two functions f and g defined below appear to be identical. However, they are identical functions only if they have the same domain and the range. Compare the domains of f and g to help you decide if they really are identical.

$$f(x)=\frac{\sqrt{x+1}}{\sqrt{x-2}} \qquad g(x)=\sqrt{\frac{x+1}{x-2}}$$

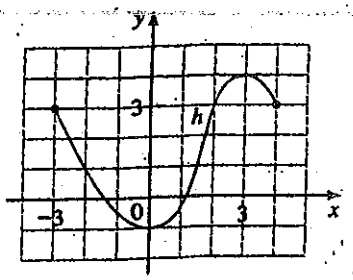
Precalculus - Functions Name_____Period_____

Answer the following questions about functions. When asked for domain, range or an interval, use interval notation.

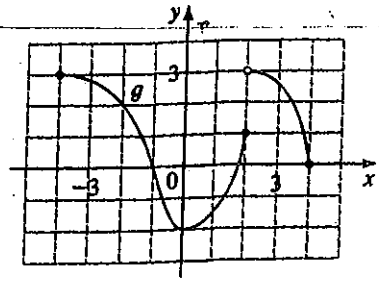
1. The graph of a function f is given.
   (a) State the values of $f(-1)$, $f(0)$, $f(1)$, and $f(3)$.
   (b) State the domain and range of f.
   (c) State the intervals on which f is increasing and on which f is decreasing.



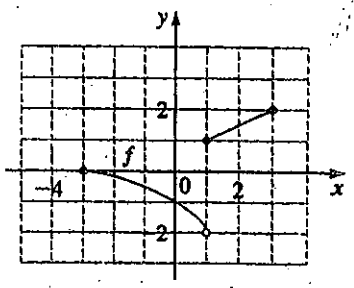
2. The graph of a function h is given.
   (a) State the values of $h(-2)$, $h(0)$, $h(2)$, and $h(3)$.
   (b) State the domain and range of h.
   (c) State the intervals on which h is increasing and on which h is decreasing.



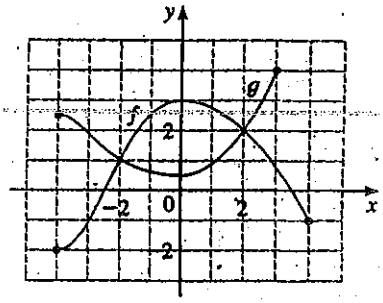
3. The graph of a function g is given.
   (a) State the values of $g(-4)$, $g(-2)$, $g(0)$, $g(2)$, and $g(4)$.
   (b) State the domain and range of g.
   (c) State the intervals on which g is increasing and on which g is decreasing.



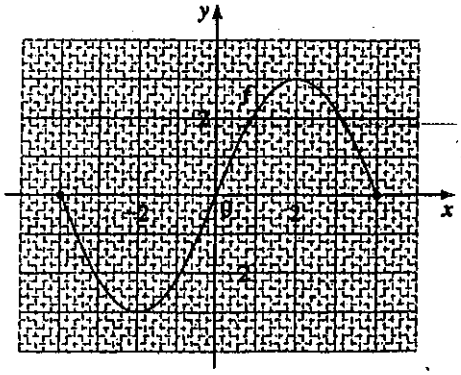
4. The graph of a function f is given.
   (a) State the values of $f(-3)$, $f(1)$, $f(2)$, and $f(3)$.
   (b) State the domain and range of f.



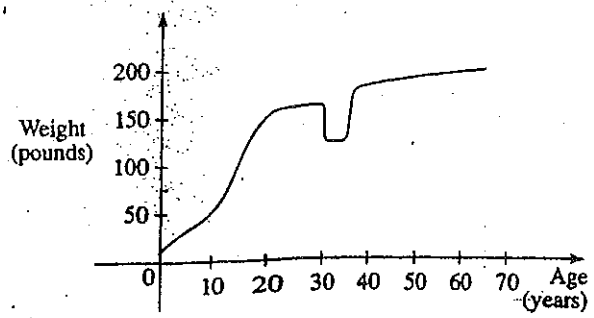
5. Graphs of the functions f and g are given.
   (a) Which is larger, $f(0)$ or $g(0)$?
   (b) Which is larger, $f(-3)$ or $g(-3)$?
   (c) For which values of x is $f(x) = g(x)$?



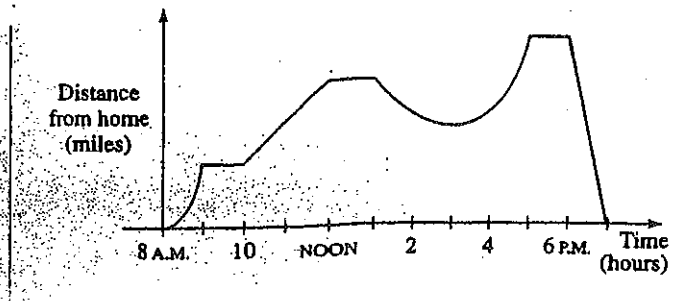
6. The graph of a function f is given.
   (a) Estimate $f(0.5)$ to the nearest tenth.
   (b) Estimate $f(3)$ to the nearest tenth.
   (c) Find all the numbers x in the domain of f so that $f(x) = 1$.



function of age. Describe in words how this person's weight has varied over time. What do you think happened when this person was 30 years old?



2. The graph gives a salesman's distance from his home as a function of time on a certain day. Describe in words what the graph indicates about his travels on this day.



3. You put some ice cubes in a glass, fill the glass with cold water, and then let the glass sit on a table. Sketch a rough graph of the temperature of the water as a function of the elapsed time.

entire graphs are shown in Figure 2–24.

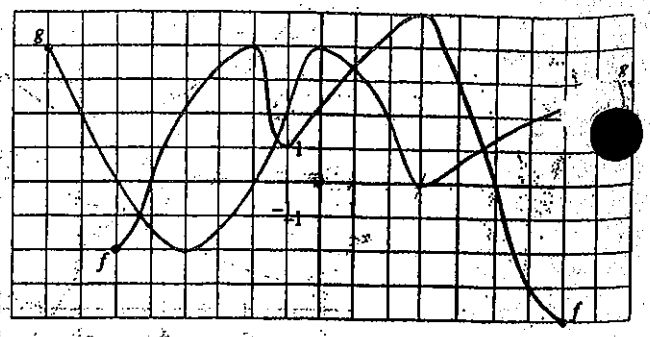


Figure 2-24

33. What is the domain of f? The domain of g?

34. What is the range of f? The range of g?

35. Find all numbers x in the interval $[-3, 1]$ such that $f(x) = 2$.

36. Find all numbers x in the interval $[-3, 3]$ such that $g(x) \geq 2$.

37. Find the number x for which $f(x) - g(x)$ is largest.

38. For how many values of x is it true that $f(x) = g(x)$?

39. Find all intervals over which both functions are defined, f is decreasing, and g is increasing.

40. Find all intervals over which g is decreasing.

Graph the following piece-wise functions by plotting points in the given intervals. These are easier to do if you do not first graph them on your calculator!!

4) $f(x) = \begin{cases} 2x + 3 & \text{if } x < -1 \\ 3 - x & \text{if } x \geq -1 \end{cases}$

5) $f(x) = \begin{cases} 1 - x^2 & \text{if } x \leq 2 \\ x & \text{if } x > 2 \end{cases}$

6) $f(x) = \begin{cases} x + 2 & \text{if } x \leq -1 \\ x^2 & \text{if } x > -1 \end{cases}$