Graphing Functions
&
An Introduction to Limits

1) **Given the function below, write equations for the graphs that are obtained from the graph of $f(x)$ as follows:**

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

a) Shift the function $f(x)$ 3 units upward.
b) Shift the function $f(x)$ 3 units downward.
c) Shift the function $f(x)$ 3 units to the right.
d) Shift the function $f(x)$ 3 units to the left.
e) Plot the graph of $f(x)$ and the graph obtained in question (a), (b), (c), and (d) on the same coordinate system.
f) Reflect $f(x)$ about the x-axis.
g) Reflect $f(x)$ about the y-axis.
h) Plot the graph of $f(x)$ and the graph obtained in question (f), and (g) on the same coordinate system.

2) In this question we shall the study the behavior of a function f near a specified point. While this is sometimes a straightforward process, it can also be quite subtle; in many instances in calculus the process for finding a limit must be applied carefully. By gaining an intuitive feel for the notion of limits, you will be laying a solid foundation for success in calculus.

Consider the function f defined by $f(x) = \dfrac{x^4 - 1}{x - 1}$.

a) By successive evaluation of f at x =1.8, 1.99, 1.999, and 1.9999, what do you think happens to the values of f as x increases towards 2?

b) Do a similar experiment on f for values of x slightly greater than 2. Again, comment on your results.

c) Use the same function f as above, but this time consider what happens as x approaches 1.

d) Study this situation experimentally as you did in parts (a) and (b) above. to gain additional feel and respect for the situation, compute the numerator and denominator of f separately for several x values before dividing. What are your conclusions and, in particular, what is the $\lim_{x \to 1} f(x)$.