Section 4: Limits

1. This problem gets students to think about what a limit is since they have no formulas to work with. Parts e through *l* cover the various limit rules; parts *h* and *l* require some thought.

1 a. Does not exist.
2 b. Does not exist.
3 c. Exists; 1
4 d. Exists; -1
5 e. Does not exist.
6 f. Exists; 4
7 g. Does not exist.
8 h. Exists; 0
9 i. Does not exist.
10 j. Exists; 0
11 k. Exists; 0
12 l. Exists; 2

when more than 1 function check one-sided limits

2. 13 a. Exists; 1
14 b. Exists; 2
15 c. Exists; 1
16 d. Exists; 1
17 e. Exists; 1 $x \to 2^-$
18 f. Exists; 0 $x \to 1^+$

squaring numbers that are to the left of -1 gives numbers that are $> +1$

3. This problem is one that every calculus student needs to understand.

   a. The left hand side is not defined at $x = 1$ while the right hand side is defined for all x. Nonetheless the discontinouity at $x = 1$ is removable, and this can be pointed out to students after they have grasped the point of this question.

   b. The expression $\dfrac{x^2 - 1}{x - 1}$ is equal to $x + 1$ for all x except $x = 1$. Since the limit measures what happens when x is near but is not equal to 1, this equation is correct.

if $\lim_{x \to c} g(x) = L$

then $\lim_{x \to c} f(g(x)) = f(L)$

$\lim f(g(x)) = f(\lim g(x))$