

1. Compute the following limits (think about the *theorems* you use).

$$\begin{array}{lll} (a) \lim_{x \rightarrow 1} \frac{x^2 - 1}{(x - 1)^2} & (b) \lim_{x \rightarrow -2} \frac{x^3 + 8}{x + 2} & (c) \lim_{x \rightarrow 1} \frac{x^3 - 2x^2 + 2x - 1}{x^3 - 1} \\ (d) \lim_{x \rightarrow 2} \frac{x^2 + 4x + 4}{x - 2} & (e) \lim_{x \rightarrow -1} \frac{\frac{1}{x} + 1}{x + 1} & (f) \lim_{x \rightarrow 2} \frac{\sqrt{2} - \sqrt{x}}{2 - x} \\ (g) \lim_{x \rightarrow 0} \frac{1 - \sqrt{1 - x^2}}{x^2} & & \end{array}$$

2. Let  $f(x) = x^2$ .

(a) Find the average rate of change of  $f(x)$  from 2 to  $2 + h$ .

(b) The average rate of change of  $f(x)$  from 3 to  $3 + h$  is  $6 + h$ .

The average rate of change of  $f(x)$  from 4 to  $4 + h$  is  $8 + h$ .

Using these results along with your answer from part (a), *guess* the average rate of change of  $f(x)$  from  $x$  to  $x + h$ .

(c) Use the average rate of change formula to prove that your guess in part (b) is correct.

3. Let  $f(x) = \sqrt{x}$ .

(a) Find the average rate of change of  $f(x)$  from 2 to  $2 + h$ .

(b) The average rate of change of  $f(x)$  from 3 to  $3 + h$  is  $\frac{1}{\sqrt{3+h} + \sqrt{3}}$ .

The average rate of change of  $f(x)$  from 4 to  $4 + h$  is  $\frac{1}{\sqrt{4+h} + \sqrt{4}}$ .

Using these results along with your answer from part (a), *guess* the average rate of change of  $f(x)$  from  $x$  to  $x + h$ .

(c) Use the average rate of change formula to prove that your guess in part (b) is correct.

4. Let  $f(x) = \frac{1}{x}$ .

(a) Find the average rate of change of  $f(x)$  from 2 to  $2 + h$ .

(b) The average rate of change of  $f(x)$  from 3 to  $3 + h$  is  $\frac{-1}{3(3+h)}$ .

The average rate of change of  $f(x)$  from 4 to  $4 + h$  is  $\frac{-1}{4(4+h)}$ .

Using these results along with your answer from part (a), *guess* the average rate of change of  $f(x)$  from  $x$  to  $x + h$ .

(c) Use the average rate of change formula to prove your guess in part (b) is correct.

5. Complete the table.