

*General Question.* Are the results reasonable, based on the graph?

1. Find all values where the function  $R$  is not continuous by using the *discont* command. Classify each discontinuity as infinite, jump, or removable. Justify your answers.

$$R(t) = \frac{t^2 - 4t - 5}{t^3 + 2t^2 - 11t - 12}$$

2. Determine all values where the function  $f$  is not differentiable. Give the exact values and justify each answer.

[*Hint.* To graph the complete function, the function needs to be written in a different form.]

$$f(x) = (x - 3)^{\frac{2}{3}} + \frac{4 \sin(x)}{x^2 + 3x - 5}$$

3. Define the following two functions.

$$g(x) = |x + 2| \cdot \sqrt[3]{x^2 + 3x - 5} \text{ and } h(x) = |x + 2| \cdot \text{surd}(x^2 + 3x - 5, 3)$$

Look at and comment on the output Maple gives.

- (a) Graph  $g$  and  $h$  (on separate coordinate planes). Then, find a value in the region where the graphs differ and evaluate (and approximate) both  $g$  and  $h$  at that value.
  - (b) Use the *iscont* command to test both  $g$  and  $h$  for continuity on the interval  $(-\infty, \infty)$ . Then use the *discont* command to find any discontinuities of both  $g$  and  $h$ . Comment on the results.
  - (c) Find where the derivative of  $h$  is discontinuous and classify the discontinuities of the derivative.
4. (a) Show that  $S$  has a removable discontinuity at  $x = 0$ , where  $S$  is defined by

$$S(x) = \frac{3^x - 1}{x}.$$

Remember to state your conclusion in a sentence.

- (b) Based on the results of part (a), a continuous function  $T$  can be defined where  $T(x) = S(x)$  for  $x$  not equal to 0, but  $T$  is defined and continuous at 0. Define the function  $T$ .
- (c) Test both  $T$  and its derivative for continuity at  $x = 0$  by using the *iscont* command.
- (d) Find the derivative of  $T$  at  $x = 0$ .