1. (a) Show that S has a removable discontinuity at 0, where S is defined by

$$S(x) = \frac{\sin(x)}{x}.$$

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) What is the derivative of T at $x = 0$?

2. 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.

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

3. Determine all values where the function f is not differentiable. Give the exact values and justify your answer.

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

4. (a) Define the following two functions.

$$g(x) = \sqrt{(x+1)^2} \cdot \sqrt[3]{x^2 - 5x + 3} - 1 \text{ and } h(x) = \sqrt{(x+1)^2} \cdot \operatorname{surd}\left(x^2 - 5x + 3, 3\right) - 1$$

Look at and comment on the output Maple gives you.

(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) Graph g and h (on separate graphs). Then, find a value in the region where the graphs differ and evaluate (and approximate) both g and h at that value.

(d) Find where the derivative of h is discontinuous and classify the discontinuities of the derivative.