Upper 6 Chapter 10

Numerical Methods

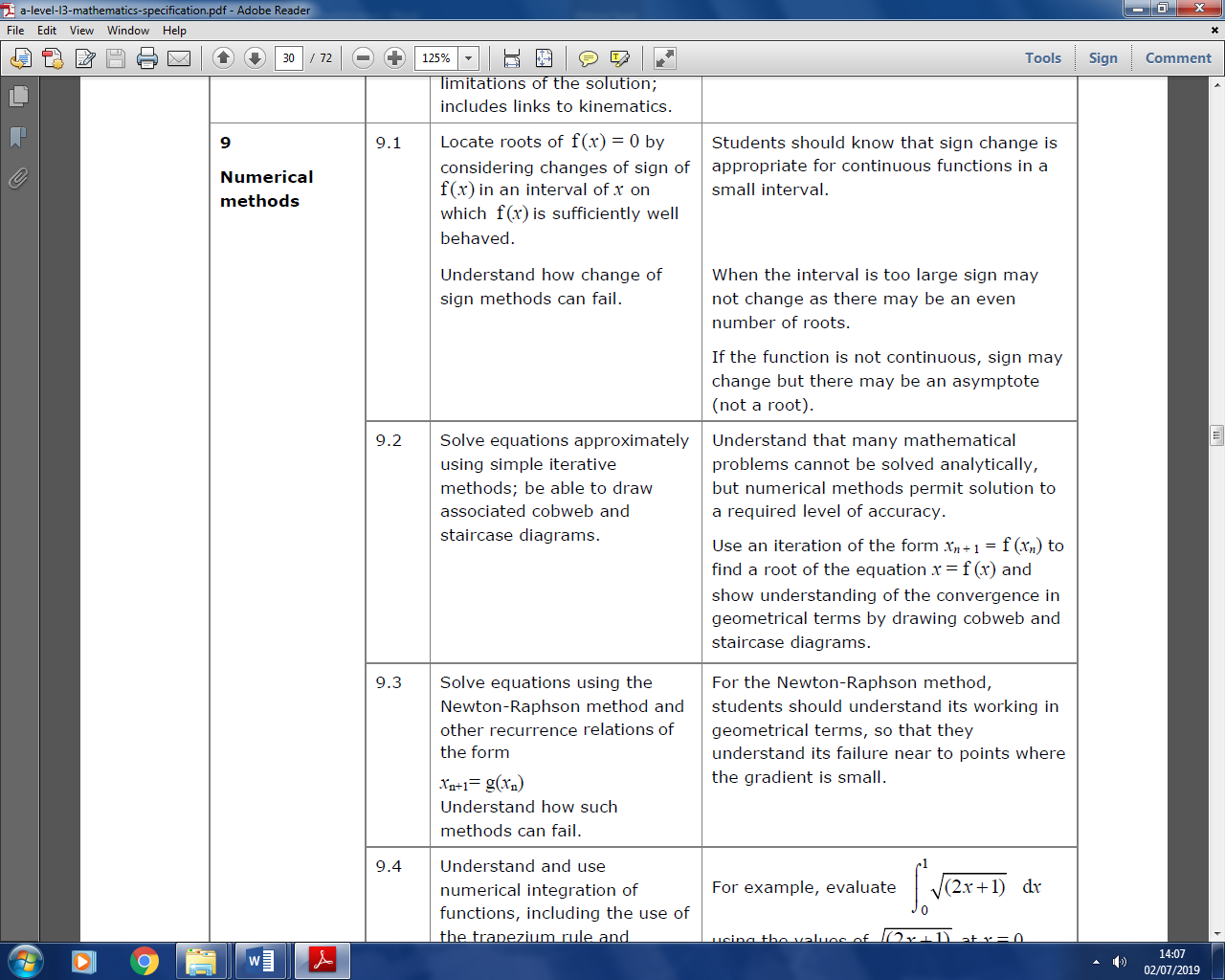
Chapter Overview

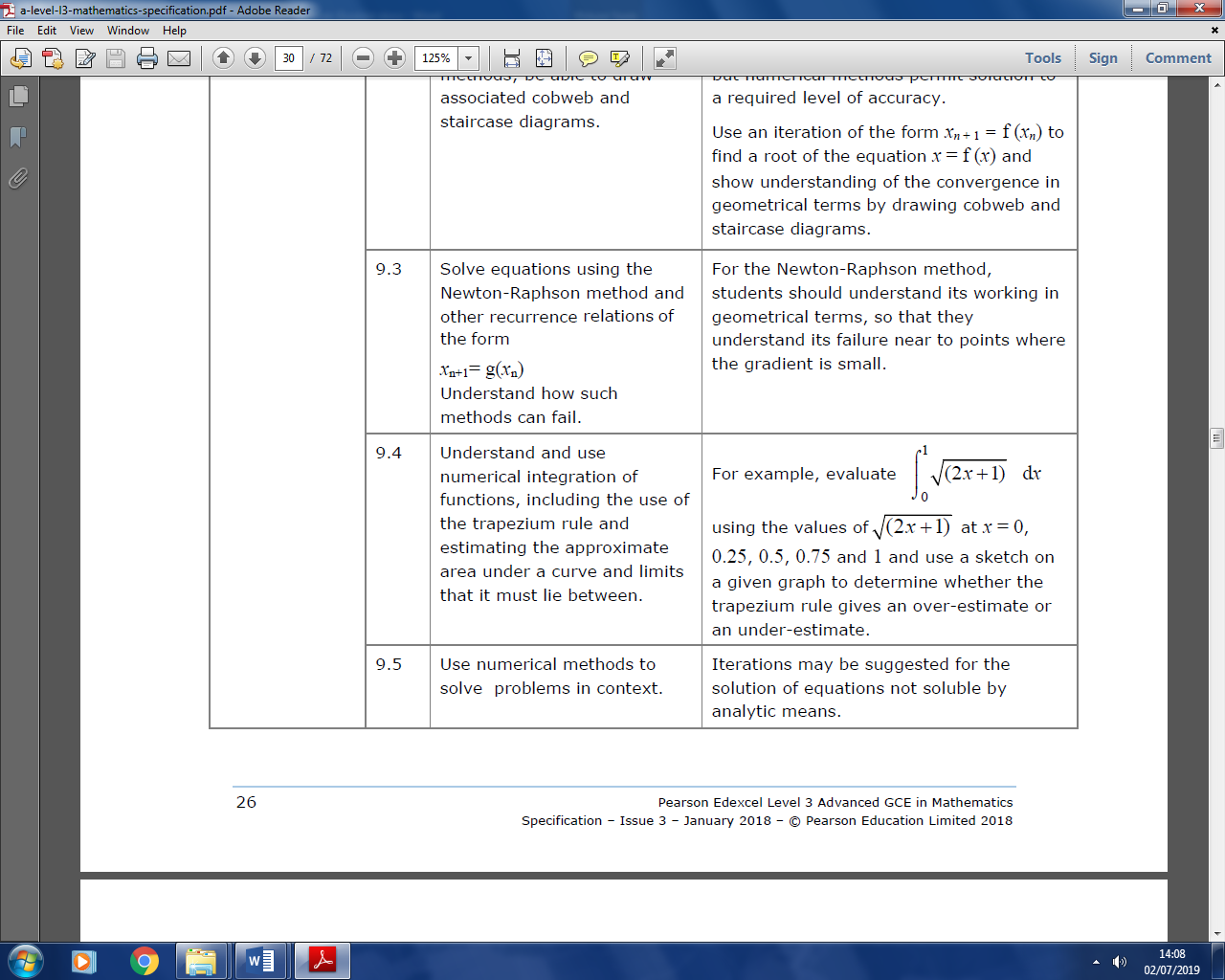
1. Locating Roots

2. Iteration

3. The Newton-Raphson Method

4. Applications to Modelling





**LOCATING ROOTS**

Finding the root of a function is to **solve the equation**

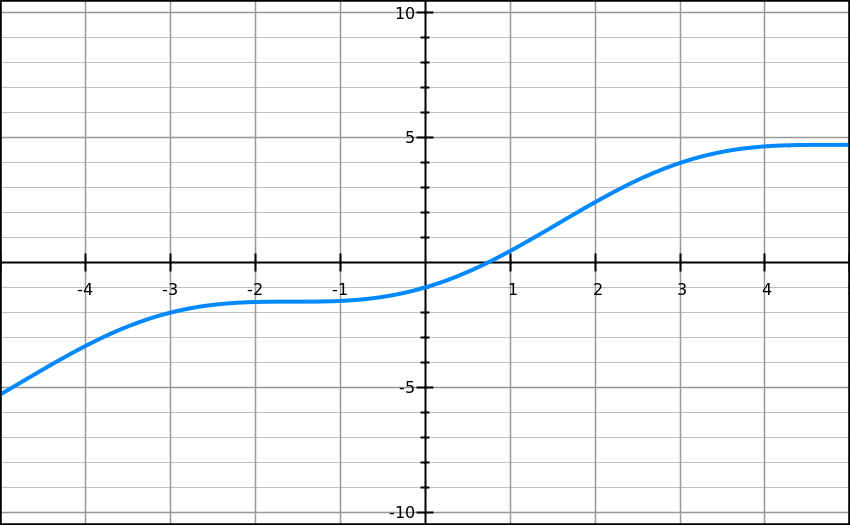
However, for some functions, the ‘exact’ root is complicated and difficult to calculate …

For example:

has the solution:

… or there is no ‘algebraic’ expression at all. (involving roots, logs, sin, cos, etc.)

For example:



has a root here

**To show that a root exists in a given interval, show that changes sign**

**Example 1**

Show that has a root between and

STEP 1: Find for the two values given in the question

STEP 2: Write a concluding statement referring to the change in sign and the fact that is a continuous function

**Note on functions that are NOT continuous:**

If the function is not continuous, the sign change may be due to an asymptote rather than a root.

For example:

When , then and .

However, although there is a sign change, a root does not exist between and

**Note on continuous functions:**

A continuous function could simply have an even number of roots in a given interval rather than no roots.

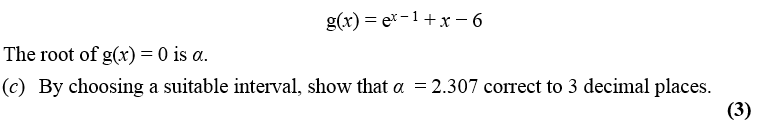
For example:

Here is negative and is also negative

However, although there are two roots, a sign change does not occur.

a

b

**Example 2**

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**Example 3**

(a) Using the same axes, sketch the graphs of and . Explain how your diagrams shows that the function has only one root.

(b) Show that this root lies in the interval

(c) Given that the root of is , show that correct to 3 decimal places.

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