Albaha University	**First Term — 1434/1435**
Faculty of Engineering	**Final-Term Examination**
Electrical Engineering Dept.	**Subject: Numerical Analysis**
TAGSEER Scheme	**Date: 17/5/1435 H**
Total Marks: 5	**Time Allowed: 30 Mins**
Student Name:	**Academic Number:** .....

Answer The Following Question: **5**

1. Find the root of the function $f(x) = x^3 + 4x^2 + 7$ in the vicinity of $x_0 = -4$, correct to 5 decimal places using Newton's method.

Solution

Since the Newton method is given using the iterative equation

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}, \tag{1}$$

$f'(x) = 3x^2 + 8x$. Starting with an initial value $x_0 = -4$, the iterations can be computed as shown in Table 1 which shows a stop at iteration no. 4 since the error is $x_4 - x_3 < 10^{-5}$ resulting in a root of $x^* = -4.36705$.

Table 1: *Iterations:*

Iteration no.	x_n	$f(x_n)$	$f'(x_n)$	x_{n+1} using (1)
1	$x_0 = -4$	7	16	-4.4375
2	-4.4375	-1.61499	23.57422	-4.36899
3	-4.36899	-0.04331	22.3123	-4.36705
4	-4.36705	-5.66891×10^{-5}	22.27698	-4.36705