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# A study on some properties of leap graphs

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**Abstract:** In a graph $G$, the first and second degrees of a vertex $v$ are equal to the number of their first and second neighbors' and are denoted by $d(v/G)$ and $d_2(v/G)$, respectively. The first, second and third leap Zagreb indices are the sum of squares of second degrees of vertices of $G$, the sum of products of second degrees of pairs of adjacent vertices in $G$ and the sum of products of first and second degrees of vertices of $G$, respectively. In this paper, we initiate in studying a new class of graphs depending on the relationship between first and second degrees of vertices and is so-called a leap graph. Some properties of the leap graphs are presented. All leap trees and $\{C_3, C_4\}$-free leap graphs are characterized.

**Keywords:** Distance-degrees (of vertices), leap Zagreb indices, leap graphs

**AMS Subject classification:** 05C07, 05C12, 05C76

## 1. Introduction

In this paper, we are concerned with simple graphs, i.e., finite graphs having no loops, multiple and directed edges. Let $G = (V, E)$ be such a graph with vertex set $V(G)$ and edges set $E(G)$. As usual, we denote by $n = |V|$ and $m = |E|$ to the number of vertices and edges in a graph $G$, respectively. The distance $d_G(u, v)$ between any two vertices $u$ and $v$ of a graph $G$ is equal to the length of (number of

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