

## MATH 421 Q1 WINTER 2017 HOMEWORK 9

Due Apr. 6, 12pm.

Total 20 points

QUESTION 1. (10 PTS) *Let the graph  $G = (\{a, b, c, d, e\}, \{\{a, b\}, \{b, c\}, \{c, d\}, \{d, a\}, \{e, a\}, \{e, b\}, \{e, c\}, \{e, d\}\})$ .*

a) (5 PTS) *Draw a visualization of this graph.*

b) (5 PTS) *Calculate the chromatic polynomial  $P_G(k)$ . You should simplify your polynomial to the form  $a_n k^n + a_{n-1} k^{n-1} + \dots + a_0$ .*

QUESTION 2. (5 PTS) *Prove that  $k^5 - k^3 + 2k$  cannot be a chromatic polynomial.*

QUESTION 3. (5 PTS) *Prove that the coefficient of  $k^{n-1}$  in  $P_G(k)$  is the negative of the number of edges. You can use the fact that for any graph of order  $n$ , its chromatic polynomial is  $k^n +$  lower order terms.*