Last name _____

First name _____

LARSON—MATH 356—CLASSROOM WORKSHEET 21
Chromatic Polynomials

Review

- (**Notation**). If $e = (v, w)$ is an edge in graph G, what is $G - \{e\}$?
- (**Notation**). If $e = (v, w)$ is an edge in graph G, what is $G/\{e\}$?
- What is a proper K-coloring of a graph G?
- Find the number of proper K-colorings of a complete graph K_n.
- Find the number of proper K-colorings of an empty graph E_n.
- Find the number of proper K-colorings of a path graph P_n.
- (**Claim**) If $e = (v, w)$ is an edge in graph G, then the number of proper K-colorings of $G - \{e\}$ where v and w have the same color is the same as the number of proper K-colorings of $G/\{e\}$.

Our goal is to *count* the number of K-colorings of a graph G.

1. What is $P(K; G)$?

2. What is $P(K; K_n)$?

3. What is $P(K; E_n)$?

4. What is $P(K; P_n)$?

5. Why does $P(K;G-\{e\}) = P(K;G/\{e\}) + P(K;G)$?

6. Why is $P(K;G)$ a *polynomial* for any graph G?

7. What is an algorithm for computing $P(K;G)$?

8. Use this algorithm to compute $P(K;C_5)$.

9. What is the complexity of this algorithm?