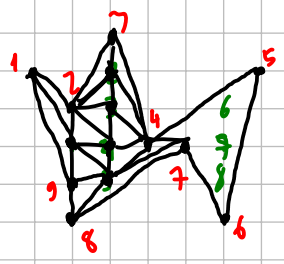
f 1/2

$A = ? = 8 + \frac{9}{2} - 1 = 11.5$



$i + \frac{b}{2} - 1$

△ $\frac{1}{2}$ □ 1

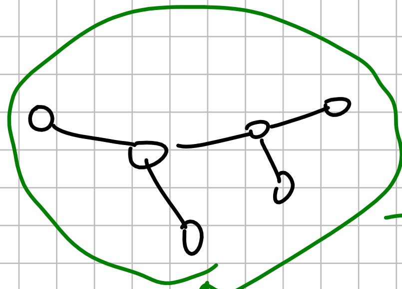
$0 + \frac{3}{2} - 1 = \frac{1}{2}$

$0 + \frac{4}{2} - 1$ ✓

$1 + \frac{4}{2} - 1 = 2$

3/2

$0 + \frac{5}{2} - 1$



$-1 = e - n$

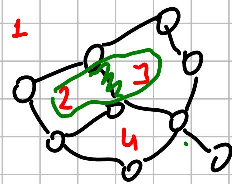
$n = e + 1$

$f = 1$ ✓

$$f = e - n + 2$$ ✓

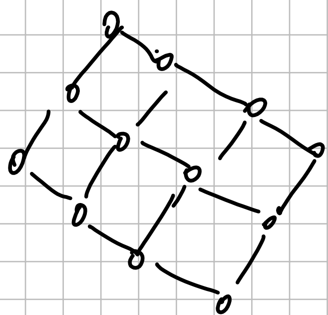
$= 1$

$A = i + \frac{b}{2} - 1$



e --;
f --;

$f = e - n + 2$



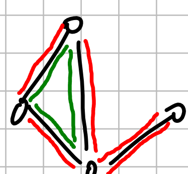
$f = e - n + 2$

$7 = e - 12 + 2$

$17 = e$

$f = 2$

$3f \leq 2e$



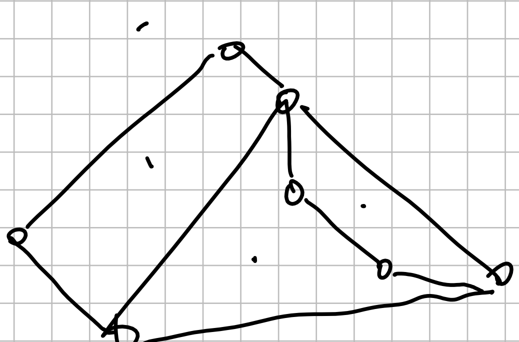
$3 + 5 = 2e$

$3f \leq L = 2e$

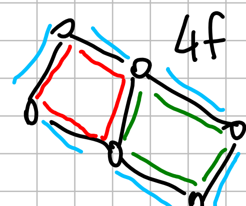
$3f \leq 2e$

- Bipar. — 5
- Coding — -
- Ham. proj → 35
- MT 30
- Fin 40

Att

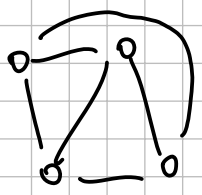


There exists no triangles in a planar graph G ⇔ No faces has 3 edges in G



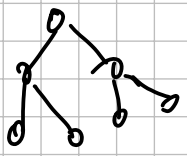
$4f \leq 4+4+6=14 = 2e$

$2f \leq e$

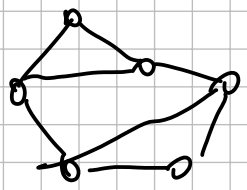


$4 \geq 2 \cdot 4 - 6$

2



$e = 8 \quad n = 6$



$8 \geq 2 \cdot 6 - 6$

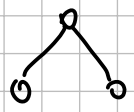
6

$n = 6$

$e = 12$

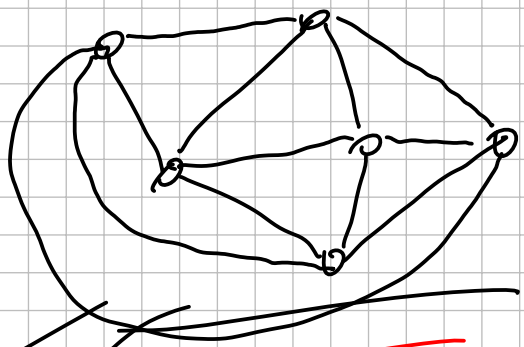
$12 \geq 2 \cdot 6 - 6$

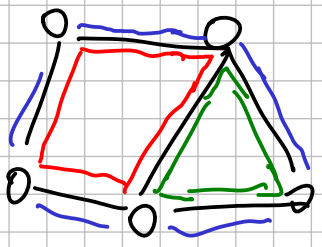
$n = 3$



$e \geq 2n - 6$

$e \leq 2n - 6$





$\sum d = 2e \geq 3f$

$e \leq 3n - 6$

$3e \leq 3n - 6 + 2e$

$\geq 3f$

$\sum d = 2e$

$\sum d = 2e \geq 3f$

3/ $f = e - n + 2$

$2e \geq 3f$

$f = e - n + 2$

$3f = 3e - 3n + 6$

$3n - 6 = 3e - 3f$

$= e + 2e - 3f$

- $(3n - 6 - e) = (2e - 3f) \geq 0$

$3n - 6 \geq e$ ✓

$f = e - n + 2$

$2f \leq e$

$e \leq 2n - 4$ ✓

$2f = 2e - 2n + 4$

$2n - 4 - e = e - 2f \geq 0$

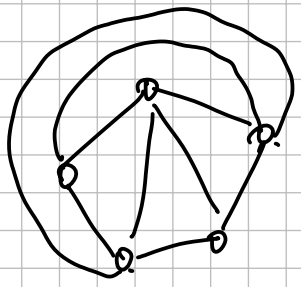
$2n - 4 \geq e$

45 vertex

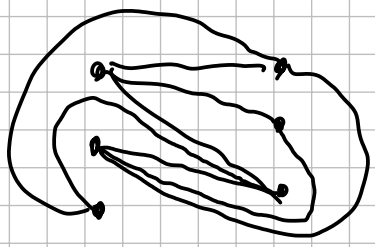
132 edge

$135 - 6 = 129$ ✓

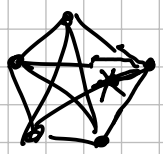
80 ~~86~~



K_5



$K_{3,3}$



K_5