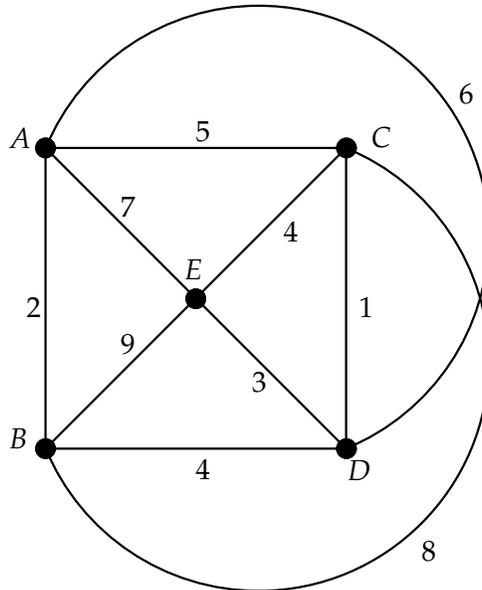


Problem 1. A woman deposits \$800 into a savings account earning 7.2% interest compounded quarterly. How long will it take for the account to reach \$2000?

Problem 2. It is possible, but not easy, to draw a three-regular, diameter three graph with twelve vertices on the plane without crossings. How many faces will such a drawing have?

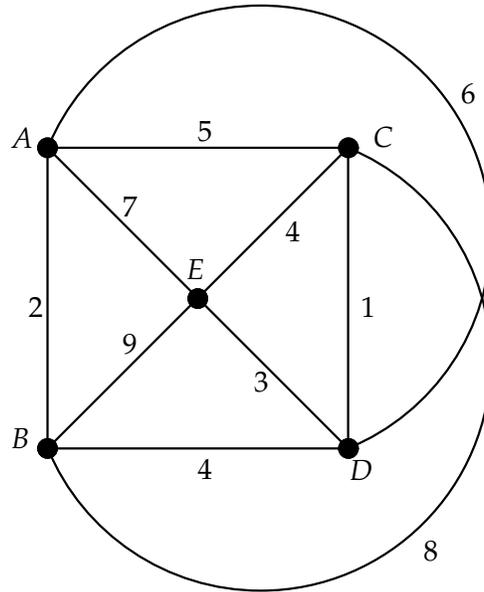
Problem 3. Consider the following weighted graph and the travelling salesman problem for this graph:



- (a) On the picture above, carefully sketch the Hamiltonian circuit produced by the nearest neighbor algorithm using C as the starting vertex. Indicate its length.

Problem 3. *Continued.*

Here is another picture of the same graph:



- (b) On this picture, carefully sketch the Hamiltonian circuit produced by the greedy algorithm. Indicate its length.

Problem 4. Circle the one that yields the largest account.

- Making monthly deposits of \$100 at 16% interest for 12 years.
- Making monthly deposits of \$200 at 8% interest for 12 years.
- Making monthly deposits of \$100 at 8% interest for 24 years.

Problem 5. A school club with 25 members is voting on whether to play soccer, baseball, or football at their club picnic. The following preference rankings were collected:

	4	3	5	3	4	6
Soccer	1	1	2	3	2	3
Baseball	2	3	1	1	3	2
Football	3	2	3	2	1	1

(a) Which game will win if the decision is made by plurality with a runoff between the top two choices?

(b) Which game will win if the decision is made by Borda's method?

Problem 5. *Continued.*

(d) Suppose that the decision will be made using the simple plurality method. Which groups of voters can vote strategically in order to bring about a preferential outcome? Circle them:

- The four voters who ranked soccer first, baseball second, and football last.

- The five voters who ranked baseball first, soccer second, and football last.

- The four voters who ranked football first, soccer second, and baseball last.

- The three voters who ranked soccer first, football second, and baseball last.

- The three voters who ranked baseball first, football second, and soccer last.

Problem 6. Use the Euclidean algorithm to find the greatest common divisor of 385 and 88. Then, find integers x and y so that $\gcd(385, 88) = x \cdot 385 + y \cdot 88$.

Problem 7. True or false:

- (a) The graph $K_{10,6}$ has 16 vertices and 60 edges.
- (b) If every vertex of a graph has even degree, then that graph has an Euler circuit.
- (c) Every election has a Condorcet winner.
- (d) 10619 is prime.
- (e) We can always find an exact solution to the travelling salesman problem if we just do the nearest neighbor algorithm repeatedly, one time starting with each vertex, and then pick the shortest circuit produced.

EXAM

Final

Math 118

December 17, 2001

- Neatness counts.
- Each part of each problem is worth 10 points, except for the true and false which are worth two points each. The total possible score is 100.

Success!