MAT 2440 - Prof. Ghezzi
Review Problems for Exam 3

NAME: _____

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1. What is the greatest common divisor of the integers $3^7 * 5^3 * 7^3 * 13$ and $2^{11} * 3^5 * 5^9 * 13^8$?
2. Are the integers $14, 27, 98$ pairwise relatively prime? Justify your answer.
3. Use the Euclidean algorithm to find $\gcd(12345, 54321)$.
4. Draw the graphs $K_{3,5}$, C_6, K_6, W_6, Q_3.
5. Convert the octal expansion of $(417)_8$ to a binary expansion.
6. Convert the decimal expansion of 417 to a binary expansion.
7. Convert the binary expansion of $(1011110111)_2$ to a hexadecimal expansion.
8. Convert the binary expansion of $(1011110111)_2$ to a decimal expansion.
9. Prove that for every positive integer n,
$$1 * 2 + 2 * 3 + \cdots + n(n+1) = \frac{n(n+1)(n+2)}{3}.$$
10. Encrypt the word MATH by translating the letters into numbers, applying the encryption function $f(p) = (11p + 7)$ **mod** 26, and then translating the numbers back into letters.
11. Decrypt the word PBSOXN which was encrypted using $f(p) = (p + 10)$ **mod** 26.
12. Find $f(2), f(3), f(4)$ if f is defined recursively by $f(0) = -1$, $f(1) = 2$ and for $n = 1, 2, \ldots$, $f(n+1) = 3f(n)^2 - 4f(n-1)^2$.
13. Construct a precedence graph for the following program:

    $S_1 : s := 5$
    $S_2 : t := 8$
    $S_3 : t := t + 1$
    $S_4 : u := s$
    $S_5 : t := t + 2$
    $S_6 : s := u + t$
    $S_7 : u := 2017$
14. a) Determine whether the graph of homework #11b) page 689 is strongly connected and if not, whether it is weakly connected. Justify your answer.

    b) Does the list of vertices b, a, d, b, a, e, d, c form a path? If it is a path: Is it a circuit? Is it simple? What is the length of the path?