MTH 301
Quiz 2
Fall 2017

20 points possible.

1. (4 pts.) Find the final values of j, s, and t after the following algorithm is executed. A supplemental page has the corresponding flowchart.

$j := -2$
$s := 8$
$t := 25$
while $j \neq 3$
  if ($j < 0$ or $j = 2$)
    then $t := t + j$
    else $s := s - 1$
  $j := j + 1$
end while

2. (3 pts.) Write using summation or product notation.

$$\frac{3}{4 \cdot 5} - \frac{4}{5 \cdot 6} + \frac{5}{6 \cdot 7} - \frac{6}{7 \cdot 8} + \frac{7}{8 \cdot 9} - \frac{8}{9 \cdot 10}$$

3. (3 pts.) A single pair of rabbits (male and female) is born at the beginning of a year. Assume the following conditions:

(1) Rabbit pairs are not fertile during their first month of life, but thereafter give birth to five new male/female pairs at the end of every month.

(2) No rabbits die.

Let p_n = the number of pairs of rabbits alive at the end of month n, for each integer $n \geq 1$, and let $p_0 = 1$. Find a recurrence relation for p_0, p_1, p_2, ...

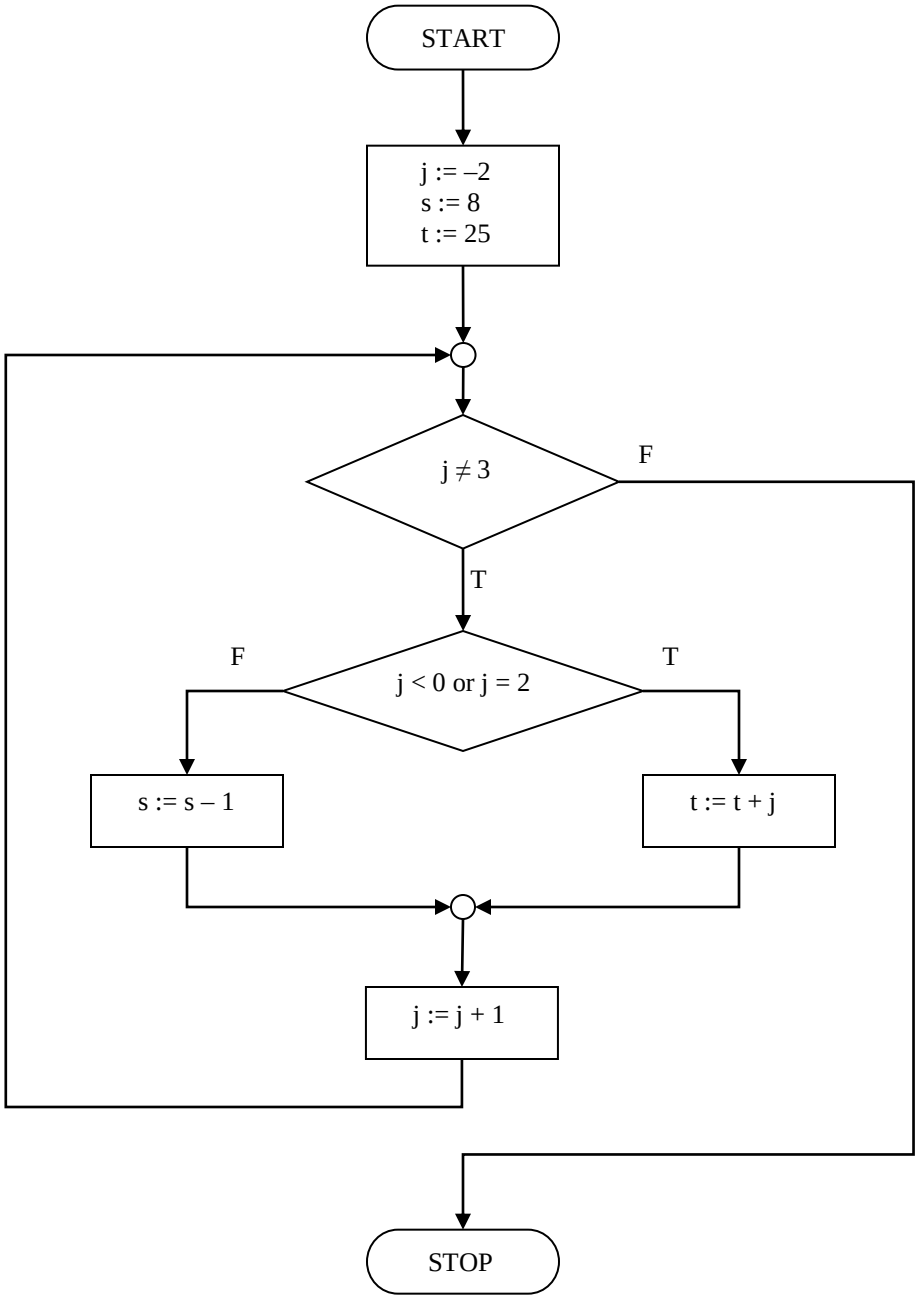
4. (5 pts.) Prove by contraposition.

For all integers n, if $7 \nmid n^2$ then $7 \nmid n$.

5. (5 pts.) Prove using mathematical induction.

For all integers $n \geq 1$,

$$5 + 9 + 13 + \cdots + (4n + 1) = n(2n + 3).$$


START
j := –2
s := 8
t := 25
j ≠ 3
F
T
j < 0 or j = 2
F
T
s := s – 1
t := t + j
j := j + 1
STOP