A real valued function:

Find a real valued function such that

$$f(x)=\frac{1}{e}-\int_{\pi}^{x} f^{2}(t)\cos(t)\,dt$$

- Please **Submit** your solution to
  - *Dr. Erol Akbas,* eakbas@gsu.edu or
  - *Dr. Tirtha Timsina,* ttimsina@gsu.edu

  before the deadline: **Monday, April 30th, 7:00PM.**
- The WINNER will be awarded with a $25 gift certificate and will be announced in the NEXT issue.

Problem of the last month:

Coffee: A coffee store in town is celebrating 1th anniversary of its opening. On the day of the celebration, store is going to reward one customer with yearlong supply of coffee. At the door, each customer is given a ticket with a randomly assigned number between 1 and 100 and writes his/her info and order on the ticket. The first customer whose number is the same as an earlier customer wins the reward. Suppose you can get in line wherever you want and you really want to win. What position would you take to maximize your chance?

Solution: Let $P(n)$ be the probability that the n$^{\text{th}}$ person wins. Then

$$P(n)=\frac{100\cdot 99\cdot 98\cdot\ldots\cdot(100-(n-2))}{100^{n-1}}\cdot\frac{n-1}{100}=\frac{(n-1)\cdot 100!}{100^{n}\cdot(100-n+1)!}\quad \text{where } 1\le n\le 100.$$

$$P(n+1)-P(n)=\frac{(100-n)!\cdot 100!}{100^{n+1}\cdot(100-n+1)}\cdot(100+n-n^{2})$$

$\Rightarrow$ $P(n+1)-P(n)$ and $100+n-n^{2}$ have the same sign and the smallest positive integer n that makes $100+n-n^{2}$ negative is 11. For all $11\le n\le 100$, $100+n-n^{2}$ is negative. So 11$^{\text{th}}$ position maximizes the chance of winning.

Winner: Joseph Moravitz

Participants with correct solutions: Joseph Moravitz, James Dillon