MDC High School Mathematics Competition 2010
Miami Dade College Wolfson Campus

Team Competition
Problem #1

Find all values of the number k for which the system

$$\begin{cases} x^2 + y^2 = 1 \\ y = k(x-2) \end{cases}$$

has exactly one solution.

MDC High School Mathematics Competition 2010
Miami Dade College Wolfson Campus

Team Competition
Problem # 2

Find all solutions to the following trigonometric equation

$$4\sin(2x)+3\cos(2x)=5$$

MDC High School Mathematics Competition 2010
Miami Dade College Wolfson Campus

Team Competition
Problem # 3

Find all functions $f(x)$ such that $f\left(\frac{x-1}{x+1}\right)=x^2$

MDC High School Mathematics Competition 2010
Miami Dade College Wolfson Campus

Team Competition
Problem # 4

Find all possible real values of the number c for which is true that

$$0 < \frac{1}{x^2 + x + c} \leq 2$$

for all real values of x.

MDC High School Mathematics Competition 2010
Miami Dade College Wolfson Campus

Team Competition
Problem # 5

Find all solutions to the following trigonometric equation

$$\cos^2\left(\frac{7x}{2}-\frac{\pi}{4}\right)+\cos^2 x=0$$

MDC High School Mathematics Competition 2010
Miami Dade College Wolfson Campus

Team Competition
Problem # 6

Find all possible real values of the number k for which the equation

$$\frac{x}{x^2+1} = k$$

has at least one real solution.

MDC High School Mathematics Competition 2010
Miami Dade College Wolfson Campus

Team Competition
Problem # 7

A mother plans to distribute her estate, worth $400000 between her four sons as follows: ¼ of the estate is to be split equally among the sons. For the rest, each son is to receive $3000 for each year that remains until his 40th birthday. Given that the sons are all 4 years apart, how much would each receive from their mother's estate?
(Hint: Let "x", "y", "z" and "w" be the amount of money that each son will receive from the splitting of $3/4$ of the estate according to age, starting with the oldest one.)

MDC High School Mathematics Competition 2010
Miami Dade College Wolfson Campus

Team Competition
Problem # 8

Find all solutions to the following trigonometric equation.

$$(1-\tan x)(1+\sin(2x)) = 1+\tan x$$