

Names:

High School:

**Thursday November 18, 2010 from 10:35 - 11:20 a.m. (45 minutes)**

**Group Work (9th and 10th grades)**

*Note: You must show all your work to receive credit. An answer alone without any supporting work will receive no credit.*

1. If the graph of the line  $y = mx + b$  intersects the ellipse given by  $x^2 + 4y^2 = 1$  exactly once, find the value of  $m^2$ .

**Names:**

**High School:**

2. If  $c$  is a real number and the negative of any solution of  $x^2 - 3x + c = 0$  is a solution of  $x^2 + 3x - c = 0$ , find the solutions of  $x^2 - 3x + c = 0$ .

**Names:**

**High School:**

3. Find all integers greater than 10 and less than 100 when written in base 10 notation are increased by 9 when their digits are reversed.

**Names:**

**High School:**

4. The ratio of  $2x - y$  to  $x + y$  is  $\frac{2}{3}$ . Find the ratio of  $x$  to  $y$ .

**Names:**

**High School:**

5. The three digit number  $2a3$  is added to the three digit number  $326$  to give the three digit number  $5b9$ , all numbers in base 10 notation. Supposing that  $5b9$  is divisible by 9, find the possible values of  $a$  and  $b$ .

**Names:**

**High School:**

6. Let  $x$  be the real number number given by

$$x = 0.48181818 \cdots = 0.48\overline{18}.$$

Find positive integers  $n, m$  so that  $x = \frac{m}{n}$ .