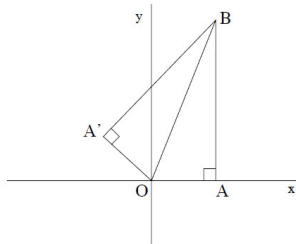


Math 280 Problems for September 21

Pythagoras Level

Problem 1: The set S contains ten numbers. The mean of the numbers in S is 23. The mean of the six smallest numbers in S is 15. The mean of the six largest numbers in S is 30. What is the median of the numbers in S ?

Problem 2: In the figure below, A and B are the points $(2, 0)$ and $(2, 5)$ respectively (O is the origin). If right triangle OAB is flipped about its hypotenuse as shown, what is the slope of the line through O and A' ?



Newton Level

Problem 3: Let $f_1(x) = f(x) = \frac{1}{1+2x}$. Then for $n > 1$, let $f_n(x) = f(f_{n-1}(x))$. So, for example, $f_3(x) = f(f(f(x)))$. Compute $f_7'(-1)$.

Problem 4: Find the limit

$$\lim_{n \rightarrow \infty} \left[\frac{(1 + \frac{1}{n})^n}{e} \right]^n.$$

Wiles Level

Problem 5: If A is the matrix $\begin{pmatrix} 1 & 3 \\ -1 & 1 \end{pmatrix}$, determine the series:

$$A - \frac{1}{3}A^2 + \frac{1}{9}A^3 + \dots + \left(-\frac{1}{3}\right)^n A^{n+1} + \dots$$

Problem 6: Compute the area of the region which lies between the x -axis and the curve, $y = e^{-x} \sin(\pi x)$, for $x \geq 0$.