Math10/11 Honors Challenging 4 Assignment

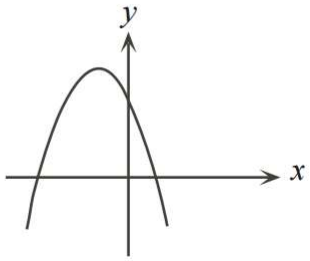
Fermat 2008

22. For how many integers k do the parabolas with equations $y = -\frac{1}{8}x^2+4$ and $y = x^2-k$ intersect on or above the x-axis?

(A) 9 **(B)** 32 **(C)** 33 **(D)** 36 **(E)** 37

Fermat 2007

20. The graph of the function $y = ax^2 + bx + c$ is shown in the diagram. Which of the following must be positive?



(A) a **(B)** bc **(C)** ab^2

(D) $b-c$ **(E)** $c-a$

Fermat 2014

25. Points $P(r,s)$ and $Q(t,u)$ are on the parabola with equation $y = x^2 - \frac{1}{5}mx + \frac{1}{5}n$ so that $PQ = 13$ and the slope of PQ is $\frac{12}{5}$. For how many pairs (m,n) of positive integers with $n \leq 1000$ is $r+s+t+u = 27$?

(A) 28 **(B)** 26 **(C)** 27 **(D)** 29 **(E)** 25

Hypatia 2013

2. A parabola has equation $y = (x-3)^2 + 1$.

(a) What are the coordinates of the vertex of the parabola?

(b) A new parabola is created by translating the original parabola 3 units to the left and 3 units up. What is the equation of the translated parabola?

(c) Determine the coordinates of the point of intersection of these two parabolas.

(d) The parabola with equation $y = ax^2 + 4$, $a < 0$, touches the parabola with equation $y = (x-3)^2 + 1$ at exactly one point. Determine the value of a.

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