UNIT 5 QUESTIONS 16-20

CO-ORD GEO

2006B 16. Regular hexagon $ABCDEF$ has vertices A and C at $(0,0)$ and $(7,1)$, respectively. What is its area?

(A) $20\sqrt{3}$ **(B)** $22\sqrt{3}$ **(C)** $25\sqrt{3}$ **(D)** $27\sqrt{3}$ **(E)** 50

2016A 16. The graphs of $y = \log_3 x$, $y = \log_x 3$, $y = \log_{\frac{1}{3}} x$, and $y = \log_x \frac{1}{3}$ are plotted on the same set of axes. How many points in the plane with positive x-coordinates lie on two or more of the graphs?

(A) 2 **(B)** 3 **(C)** 4 **(D)** 5 **(E)** 6

2018A 16. Which of the following describes the set of values of a for which the curves $x^2 + y^2 = a^2$ and $y = x^2 - a$ in the real xy-plane intersect at exactly 3 points?

(A) $a = \frac{1}{4}$ **(B)** $\frac{1}{4} < a < \frac{1}{2}$ **(C)** $a > \frac{1}{4}$ **(D)** $a = \frac{1}{2}$

(E) $a > \frac{1}{2}$

2008B 17. Let A, B and C be three distinct points on the graph of $y = x^2$ such that line AB is parallel to the x-axis and $\triangle ABC$ is a right triangle with area 2008. What is the sum of the digits of the y-coordinate of C?

(A) 16 **(B)** 17 **(C)** 18 **(D)** 19 **(E)** 20

2012B 17. Square $PQRS$ lies in the first quadrant. Points $(3,0)$, $(5,0)$, $(7,0)$, and $(13,0)$ lie on lines SP, RQ, PQ, and SR, respectively. What is the sum of the coordinates of the center of the square $PQRS$?

(A) 6 **(B)** 6.2 **(C)** 6.4 **(D)** 6.6 **(E)** 6.8

2014B 17. Let $\mathcal{P}$ be the parabola with equation $y = x^2$ and let $Q = (20, 14)$. There are real numbers r and s such that the line through Q with slope m does not intersect $\mathcal{P}$ if and only if $r < m < s$. What is $r + s$?

(A) 1 **(B)** 26 **(C)** 40 **(D)** 52 **(E)** 80

2002A 18. Let C_1 and C_2 be circles defined by

$$(x-10)^2 + y^2 = 36$$

and

$$(x+15)^2 + y^2 = 81,$$

respectively. What is the length of the shortest line segment $\overline{PQ}$ that is tangent to C_1 at P and to C_2 at Q?

(A) 15 **(B)** 18 **(C)** 20 **(D)** 21 **(E)** 24

2005B 18. Let $A(2,2)$ and $B(7,7)$ be points in the plane. Define R as the region in the first quadrant consisting of those points C such that $\triangle ABC$ is an acute triangle. What is the closest integer to the area of the region R?

(A) 25 **(B)** 39 **(C)** 51 **(D)** 60 **(E)** 80

2016B 18. What is the area of the region enclosed by the graph of the equation $x^2 + y^2 = |x| + |y|$?

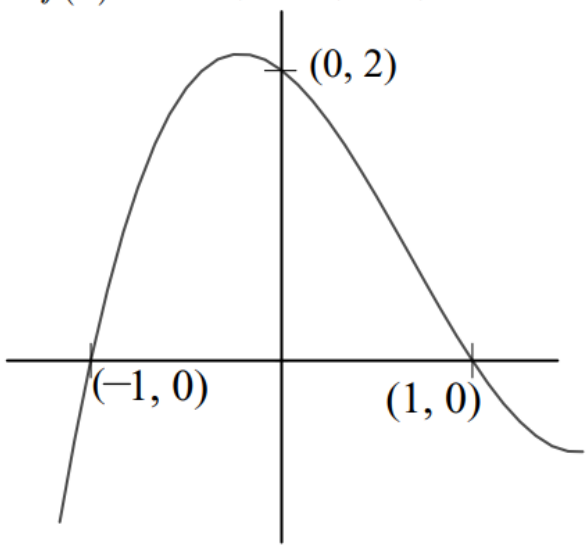
(A) $\pi + \sqrt{2}$ **(B)** $\pi + 2$ **(C)** $\pi + 2\sqrt{2}$ **(D)** $2\pi + \sqrt{2}$ **(E)** $2\pi + 2\sqrt{2}$

2011B 19. A lattice point in an xy-coordinate system is any point (x, y) where both x and y are integers. The graph of $y = mx + 2$ passes through no lattice point with $0 < x \leq 100$ for all m such that $\frac{1}{2} < m < a$. What is the maximum possible value of a?

(A) $\frac{51}{101}$ **(B)** $\frac{50}{99}$ **(C)** $\frac{51}{100}$ **(D)** $\frac{52}{101}$ **(E)** $\frac{13}{25}$

2011

2003B 20. Part of the graph of $f(x) = ax^3 + bx^2 + cx + d$ is shown. What is b?



(A) -4 **(B)** -2 **(C)** 0 **(D)** 2 **(E)** 4

2007B 20. The parallelogram bounded by the lines $y = ax + c$, $y = ax + d$, $y = bx + c$, and $y = bx + d$ has area 18. The parallelogram bounded by the lines $y = ax + c$, $y = ax - d$, $y = bx + c$, and $y = bx - d$ has area 72. Given that a, b, c, and d are positive integers, what is the smallest possible value of $a + b + c + d$?

(A) 13 **(B)** 14 **(C)** 15 **(D)** 16 **(E)** 17