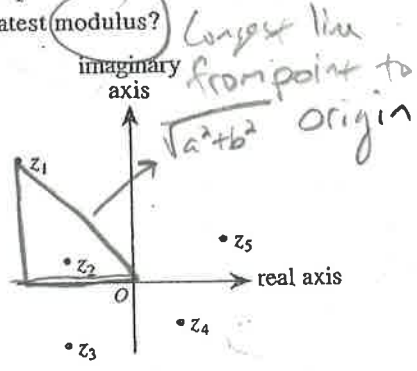




48. In the complex plane, the horizontal axis is called the *real axis* and the vertical axis is called the *imaginary axis*. The complex number $a + bi$ graphed in the complex plane is comparable to the point (a,b) graphed in the standard (x,y) coordinate plane. The *modulus* of the complex number $a + bi$ is given by $\sqrt{a^2 + b^2}$. Which of the complex numbers $z_1, z_2, z_3, z_4,$ and z_5 below has the greatest modulus?



- F. z_1
- G. z_2
- H. z_3
- J. z_4
- K. z_5

49. In the real numbers, what is the solution of the equation $8^{2x+1} = 4^{1-x}$?

- A. $-\frac{1}{3}$
- B. $-\frac{1}{4}$
- C. $-\frac{1}{8}$
- D. 0
- E. $\frac{1}{7}$

Handwritten solution:

$$(2^3)^{2x+1} = (2^2)^{1-x}$$

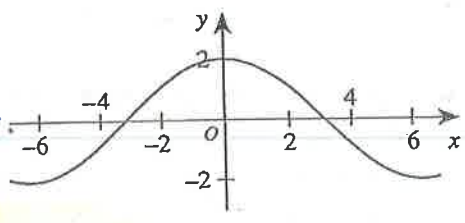
$$2^{6x+3} = 2^{2-2x}$$

$$6x+3 = 2-2x$$

$$4x = -1$$

$$x = -\frac{1}{4}$$

50. The graph of the trigonometric function $y = 2 \cos\left(\frac{1}{2}x\right)$ is shown below.



F is correct!!

- The function is:
- even (that is, $f(x) = f(-x)$ for all x).
 - odd (that is, $f(-x) = -f(x)$ for all x).
 - neither even nor odd.
 - the inverse of a cotangent function.
 - undefined at $x = \pi$.

51. An integer from 100 through 999, inclusive, is to be chosen at random. What is the probability that the number chosen will have 0 as at least 1 digit?

Handwritten solution:

900 total

100	120
101	130
102	140
103	150
104	160
105	170
106	180
107	190
108	200
109	210
110	220

100-990

19.9

- A. $\frac{19}{900}$
- B. $\frac{81}{900}$
- C. $\frac{90}{900}$
- D. $\frac{171}{900}$
- E. $\frac{271}{1,000}$

52. In the figure below, line q in the standard (x,y) coordinate plane has equation $-2x + y = 1$ and intersects line r , which is distinct from line q , at a point on the x -axis. The angles, $\angle a$ and $\angle b$, formed by these lines and the x -axis are congruent. What is the slope of line r ?

Handwritten solution:

Line $q: y = 1 + 2x$

Line $r: x = -\frac{1}{2}$

Intersection: $(-\frac{1}{2}, 0)$

Line r is perpendicular to the x -axis.

Angles $\angle a$ and $\angle b$ are congruent.

Slope of r is $M = 2$.

Line r is perpendicular to line q .

Slope of q is $M = 2$.

Slope of r is $M = -\frac{1}{2}$.

Answer: K. Cannot be determined from the given information

53. In the right triangle below, $0 < b < a$. One of the angle measures in the triangle is $\tan^{-1}\left(\frac{a}{b}\right)$. What is $\cos\left[\tan^{-1}\left(\frac{a}{b}\right)\right]$?

Handwritten solution:

Right triangle with legs a and b , and hypotenuse $\sqrt{a^2 + b^2}$.

Angle θ is at the vertex with legs a and b .

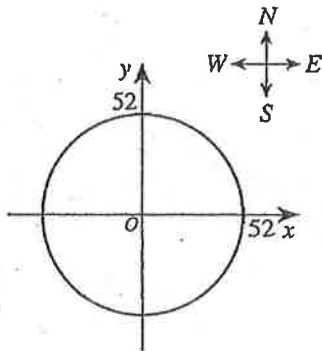
$\cos \theta = \frac{b}{\sqrt{a^2 + b^2}}$

- A. $\frac{a}{b}$
- B. $\frac{b}{a}$
- C. $\frac{a}{\sqrt{a^2 + b^2}}$
- D. $\frac{b}{\sqrt{a^2 + b^2}}$
- E. $\frac{\sqrt{a^2 + b^2}}{a}$



Use the following information to answer questions 54–56.

The radio signal from the transmitter site of radio station WGGW can be received only within a radius of 52 miles in all directions from the transmitter site. A map of the region of coverage of the radio signal is shown below in the standard (x,y) coordinate plane, with the transmitter site at the origin and 1 coordinate unit representing 1 mile.



54. Which of the following is closest to the area, in square miles, of the region of coverage of the radio signal?

- F. 2,120
- G. 2,700
- H. 4,250
- J. 8,500**
- K. 16,990

$$\pi r^2 = 52^2 \pi \approx 8494.867$$

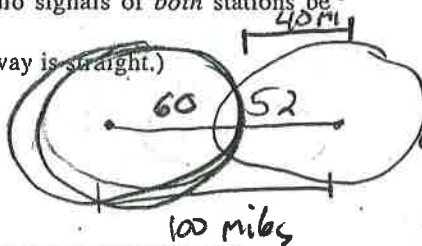
55. Which of the following is an equation of the circle shown on the map?

- A. $x + y = 52$
- B. $(x + y)^2 = 52$
- C. $(x + y)^2 = 52^2$
- D. $x^2 + y^2 = 52$
- E. $x^2 + y^2 = 52^2$**

56. The transmitter site of radio station WGGW and the transmitter site of another radio station, WGWB, are on the same highway 100 miles apart. The radio signal from the transmitter site of WGGW can be received only within a radius of 60 miles in all directions from the WGGW transmitter site. For how many miles along the highway can the radio signals of both stations be received?

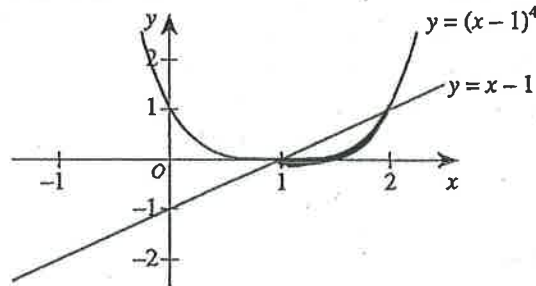
(Note: Assume the highway is straight.)

- F. 8
- G. 12**
- H. 40
- J. 44
- K. 48



- F. 25.5
- G. 30
- H. 169.85
- J. 170**
- K. 199.85

57. The graphs of the equations $y = x - 1$ and $y = (x - 1)^4$ are shown in the standard (x,y) coordinate plane below. What real values of x , if any, satisfy the inequality $(x - 1)^4 < (x - 1)$?



- A. No real values
- B. $x < 0$ and $x > 1$
- C. $x < 1$ and $x > 2$
- D. $0 < x < 1$
- E. $1 < x < 2$**

58. For every positive 2-digit number, x , with tens digit t and units digit u , let y be the 2-digit number formed by reversing the digits of x . Which of the following expressions is equivalent to $x - y$?

- F. $9(t - u)$**
- G. $9(u - t)$
- H. $9t - u$
- J. $9u - t$
- K. 0

$$x = 10t + u$$

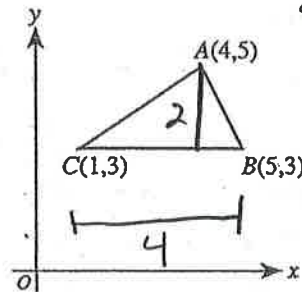
$$y = 10u + t$$

$$10t + u - (10u + t) = 9t - 9u = 9(t - u)$$

59. In the figure below, the vertices of $\triangle ABC$ have (x,y) coordinates $(4,5)$, $(5,3)$, and $(1,3)$, respectively. What is the area of $\triangle ABC$?

$$A = \frac{1}{2}(4)(2) = 4$$

- A. 4**
- B. $4\sqrt{2}$
- C. $4\sqrt{3}$
- D. 8
- E. $8\sqrt{2}$



60. The sum of an infinite geometric series with first term a and common ratio $r < 1$ is given by $\frac{a}{1-r}$. The sum of a given infinite geometric series is 200, and the common ratio is 0.15. What is the second term of this series?

Just read carefully!

$$\frac{a}{1-0.15} = 200$$

$$\frac{a}{0.85} = 200$$

$$170 \times 0.15 = 25.5 \text{ term}$$

$$a = 170 \text{ END OF TEST 2}$$

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.
DO NOT RETURN TO THE PREVIOUS TEST.