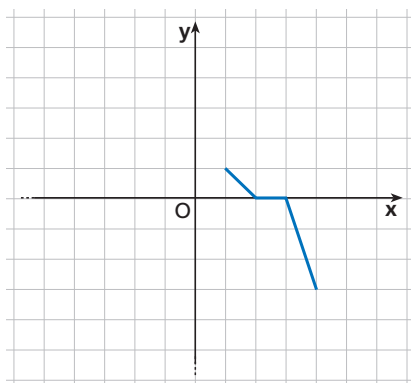



TEST YOUR SKILLS

- 1** Part of a graph is given below.



Sketch the rest of this graph if the graph has the indicate symmetry.

- y -axis symmetry.
- x -axis symmetry.
- Origin symmetry.
- Both y -axis and origin symmetry.

(USA Tacoma Community College, Worksheet)

- 2** **TEST** Which of the following functions is symmetric respect to the y -axis?

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

(USA University of Wyoming, Practice Test, Finals)

- 3** Determine (algebraically) if each function is even, odd, or neither.

- $y = |x + 2|$.
- $y = |x| + 2$.
- $y = x^2 + 3$.
- $y = x^2 + 3x$.
- $y = x^3 - 5x$.
- $y = x^3 - 5$.

(USA Tacoma Community College, Worksheet)

**[a] neither; b) even; c) even;
 d) neither; e) odd; f) neither]**

- 4** **TEST** Starting with the point $(3; 4)$ in the cartesian plane, reflect it across the x -axis, then rotate it 180° around the origin, and then finally translate it vertically by 5 units. The final point is:

- A** $(8; -4)$. **D** $(-4; 8)$.
 B $(3; 9)$. **E** $(-3; 9)$.
 C $(-3; 1)$.

(USA Marywood University Mathematics Contest, 2001)

- 5** **TEST** The point $(a; b)$ is reflected over the y -axis to the point $(c; d)$, which is reflected over the x -axis to the point $(e; f)$. Compute $ab - ef$.

- A** 0. **D** $2cd$.
 B 2. **E** $-2cd$.
 C $2ab$.

(USA University of North Carolina: State Mathematics Finals Contest, 2003)

- 6** **TEST** Let P be the point $(3; 2)$. Let Q be the reflection of P about the x -axis, let R be the reflection of Q about the line $y = -x$ and let S be the reflection of R through the origin. Then $PQRS$ is a convex quadrilateral. What is the area of $PQRS$?

- A** 14 **B** 15 **C** 16 **D** 17 **E** 18

(USA North Carolina: State High School Mathematics Contest, 1997)

- 7** Suppose that a particle sitting at the point $(3; 6)$ is rotated 30° in the clockwise direction about the point $(-1; 2)$. Give the coordinates of the new location of the particle.

(USA Texas A&M University Math Contest, 1999)

$[(2\sqrt{3} + 1; 2\sqrt{3})]$

- 8** Find the vertex of the parabola $x^2 + 2y = 2$.

(USA Southern Illinois University Carbondale, Final Exam, 2002)

$[(0; 1)]$

TEST

- 9** Given that the vertex of the parabola $y = x^2 + 8x + k$ is on the x -axis, what is the value of k ?

- A** 0 **B** 4 **C** 8 **D** 16 **E** 24

(USA University of South Carolina: High School Math Contest, 2001)

10 The graph of two parabolas $y = 2x^2$ and $y = x^2 + x + 6$ intersect in two points. An equation for the line that passes through these two points is:

- A** $x - 2y + 18 = 0$. **D** $2x - y + 4 = 0$.
B $2x - y - 18 = 0$. **E** $x - 2y + 12 = 0$.
C $2x - y + 12 = 0$.

(USA North Carolina State High School Mathematics Contest, 2003)

11 Let $P(a; b)$ and $Q(c; d)$ denote two distinct points on the graph of $y = x^2$. Suppose that the slope of line PQ is 5 and the x coordinates of P and Q differ by 1. Find $b + d$.

- A** 41. **D** 5.
B 25. **E** None of these.
C 13.

(USA North Carolina State High School Mathematics Contest, 2003)

12 A toy rocket is fired vertically from the ground. Its height in meters above the ground is given by $s(t) = 36t - 4.9t^2$, where t represents the time in seconds. What is the maximum height of the rocket?

(USA Southeast Missouri State University: Math Field Day, 2005)

[66.12 m]

13 Let $y = -4x^2 - 2x + 3$.

- a) Find the y -intercept. Find the vertex and axis of symmetry. Sketch.
 b) Find the x -intercept, if any. Indicate them on your graph of part a.
 c) Determine whether y has a maximum value or a minimum value and state that value.

(USA Southern Illinois University Carbondale, Final Exam, 2002)

$$\left[\begin{array}{l} \text{a) } y = 3; V\left(-\frac{1}{4}; \frac{13}{4}\right); x = -\frac{1}{4}; \\ \text{b) } x = \frac{-1 \pm \sqrt{13}}{4}; \text{c) max: } y = \frac{13}{4} \end{array} \right]$$

TEST

14 The maximum value of the quadratic function $y = -x^2 + 4x - 1$ is:

- A** 3.
B -3.
C 2.
D 5.
E -5.

(USA Marywood University Mathematics Contest, 2006)

15 Which of the following statements regarding $y = 3x^2 - 12$ are true?

- The slope is 3.
- y is increasing for all x .
- The x -intercepts are $(\pm 2; 0)$.
- The y -intercept is $(0; -12)$.
- The vertex is $(0; -12)$.

- A** 1, 2, and 3.
B 3, 4, and 5.
C 3 and 4.
D 2 and 4.
E 3 and 5.

(USA University of Wyoming, Test, 2004)

16 The vertex of the graph of the quadratic function $y = 2x^2 + 4x - 3$ is at the point:

- A** $(0; -3)$.
B $(2; 13)$.
C $(-1; -5)$.
D $(1; 3)$.
E $(-1; 5)$.

(USA Marywood University Mathematics Contest, 2001)

17 Given a circle centered at $(3; 4)$ that passes through point $(7; 1)$, which of the following is the equation of the tangent line to the circle at point $(7; 1)$?

- A** $4x - 3y = 25$
B $3x + 4y = 25$
C $3x - 4y = 17$
D $4x + 3y = 31$
E None of these.

(USA North Carolina State High School Mathematics Contest, 2004)

18 What is the y -component of the center of the circle which passes through $(-1; 2)$, $(3; 2)$ and $(5; 4)$?

(USA Lehigh University: High School Math Contest, 2001)

[6]

19 Find the equation of the circle that has a diameter with endpoints $(1; 1)$ and $(7; 5)$.

(USA Southern Illinois University Carbondale, Final Exam, 2003)

$$[x^2 + y^2 - 8x - 6y + 12 = 0]$$

20 Find the radius of a circle whose equations is $x^2 + y^2 = 12y - 10x - 10$.

(USA Indiana State Mathematics Contest, 2006)

[$\sqrt{51}$]

TEST

- 21** An ellipse is centered at $(0; 0)$ with foci at $(-4; 0)$. Its eccentricity $e = 0.8$. What is the equation for the ellipse?

A $\frac{x^2}{64} + \frac{y^2}{16} = 1$

B $\frac{x^2}{25} + \frac{y^2}{16} = 1$

C $\frac{x^2}{25} + \frac{y^2}{9} = 1$

D $\frac{x^2}{16} + \frac{y^2}{9} = 1$

- E** None of these.

(USA Marywood University Mathematics Contest, 2006)

- 22** What is the radius of the circle $x^2 + y^2 - 4x + 10y = 7$?

A 7

B 6

C 5

D 4

- E** None of these.

(USA Marywood University Mathematics Contest, 2006)

- 23** Circle U passes through points $(3; 11)$, $(11; -1)$ and $(-14; 4)$. Find the coordinates of the center of circle U .

A $(-2; -1)$.

B $(-1; -2)$.

C $(2; 1)$.

D $(1; 2)$.

- E** None of the above.

(USA Catawba College NCCTM Mathematics Contest, 2005)

- 24** Classify the curve $\frac{x^2}{4} + \frac{y^2}{36} = 1$ as one of parabola, ellipse, or hyperbola. Sketch the graph, with foci and vertices clearly labeled. [ellipse]

- 25** Another way to define eccentricity for a hyperbola or an ellipse is $e = \frac{c}{a}$. Find the eccentricity of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$.

(USA Central Lake College, Worksheet)

$$\left[e = \frac{3}{5} \right]$$

GLOSSARY

algebraically: algebricamente	endpoint: estremo	line: retta	slope: pendenza
center: centro	even: pari	odd: dispari	statement: affermazione
circle: circonferenza	to fire: sparare	quadratic (function): (funzione) quadratica	tangent line: retta tangente
clockwise: in senso orario	focus (foci): fuoco (fuochi)	radius: raggio	toy rocket: razzo giocattolo
to denote: denotare	graph: grafico	to reflect: riflettere	to translate: traslare
eccentricity: eccentricità	ground: suolo	to regard: riguardare	vertex: vertice
ellipse: ellisse	height: altezza	to rotate: ruotare	
	hyperbola: iperbole		