

1) If (ax, by) is the **midpoint** of the line segment joining the points $(\sqrt{2}x, -x)$ and $(\sqrt{2}x, x + 2y)$, then $a + b =$

A) $\sqrt{2} + 1$

B) $2\sqrt{2} + 1$

C) $2\sqrt{2} + 2$

D) $\sqrt{2} + 2$

E) $\sqrt{2} - 1$

2) If the **distance** between the points $(2x + 1, -x + 3)$ and $(-x + 1, -3x + 3)$ is equal to $\sqrt{13}$, where $x < 0$, then $x =$

A) -1

B) -2

C) 0

D) 13

E) -13

3) If the graph of the circle $(x - 3)^2 + (y + 4)^2 = (k - 1)^2$ is **tangent** to the x -axis, then a possible value of k is equal to

A) -3

B) -5

C) -4

D) 4

E) 3

4) If the circle $2x^2 + 2y^2 - 12x + 8y + 8 = 0$ has center (a, b) and radius r , then $a + b + r =$

A) 4

B) 8

C) 10

D) 2

E) 5

5) The graph of the equation $2x^2y^2 = |x^3 - y^3|$ is

- A) symmetry with respect to the origin only
- B) symmetry with respect to the y -axis only
- C) symmetry with respect to the x -axis only
- D) symmetry with respect to the x -axis, y -axis, and the origin
- E) not symmetry with respect to the x -axis, y -axis, nor the origin

6) If $ax + by + c = 0$ is the equation of line that passes through $(-2, 4)$ and perpendicular to the line $8x + 2y = -1$, then $\frac{c}{a} =$

- A) 18
- B) $\frac{9}{2}$
- C) 9
- D) $\frac{9}{8}$
- E) $\frac{1}{8}$

7) If the line $\frac{3}{2}x + by = c$ with y -intercept -2 , is parallel to the line $3x + 4y = 12$, then $b + c =$

A) -2

B) -6

C) 6

D) 4

E) 2

8) If $x = 2 \pm \sqrt{3}$ are the solutions of the quadratic equation $ax^2 + 4x + c = 0$, then $a - c =$

A) 0

B) -3

C) -2

D) 4

E) 2

9) If the equation $x(x - 3) + 2 = 0$ is written in the form $(x + a)^2 = b$,
then $a + b =$

A) $-\frac{5}{4}$

B) $-\frac{7}{2}$

C) $\frac{7}{4}$

D) $\frac{5}{4}$

E) $\frac{7}{2}$

10) If $\frac{1 + 3i}{2i - \sqrt[3]{-8}} + \frac{1}{2}i^{13} = a + bi$, then $a + b =$

A) 2

B) 0

C) 1

D) $\frac{3}{2}$

E) $\frac{5}{2}$

11) The **real part** of the complex number $(1 - 2i)(1 + 2i)\sqrt{-8} \cdot \sqrt{-2}$, is

A) -20

B) 20

C) -4

D) 4

E) 0

12) The **sum** of all the solution(s) of the equation $\sqrt{2x + 13} = x - 1$, is

A) 6

B) 4

C) -4

D) 8

E) -8

13) The value of k for which the quadratic equation $kx^2 + 2kx + 1 = 0$ has two **nonreal** solutions is

- A) $(0, 1)$
- B) $(1, \infty)$
- C) $(-\infty, 0)$
- D) $(-\infty, 1)$
- E) $(-\infty, 0) \cup (1, \infty)$

14) The **solution set** of the inequality $\frac{3x + 1}{x - 2} \geq 4$, is equal to

- A) $(2, 9]$
- B) $[-9, 2)$
- C) $(-\infty, 2) \cup [9, \infty)$
- D) $(-\infty, 2] \cup [9, \infty)$
- E) $(-\infty, -9) \cup (2, \infty)$

15) The **sum** of all the solution(s) of the equation $2|x + 3| - 5 = -1$, is

A) -6

B) -1

C) 1

D) -2

E) 5

16) The **domain** of the function $f(x) = \frac{1}{\sqrt{1-x}}$, in interval notation, is

A) $(-\infty, 1)$

B) $(-\infty, 0)$

C) $(0, \infty)$

D) $(1, \infty)$

E) $(0, 1)$

17) If $f(x) = \begin{cases} -4, & \text{if } x \leq 0 \\ x^2 - 4, & \text{if } 0 < x \leq 2 \\ -x, & \text{if } x > 2 \end{cases}$, then $f(-2) + f(1) - f(3) =$

A) -4

B) 4

C) -10

D) 5

E) 10

18) The y -intercept of the function $y = \left\lfloor \frac{x}{3} - \frac{3}{2} \right\rfloor$, where $\lfloor \cdot \rfloor$ is the greatest integer function, is

A) -2

B) -1

C) -3

D) $-\frac{3}{2}$

E) $\frac{3}{2}$

19) The graph of the function $f(x) = \begin{cases} -x^2 + 4, & \text{if } x \leq 2 \\ -2, & \text{if } x > 2 \end{cases}$

- A) is decreasing on the interval $(0, 2)$
- B) is constant on the interval $(-2, \infty)$
- C) is increasing on the interval $(-2, 2)$
- D) is increasing on the interval $(-2, 4)$
- E) is decreasing on the interval $(2, 4)$

20) Which of the following points lies on the graph of a linear function with x -intercept $(3, 0)$ and a slope 4 ?

- A) $(0, -12)$
- B) $(1, -4)$
- C) $(2, -2)$
- D) $(4, -4)$
- E) $(3, -6)$