Alg2H - Summative 5

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Which of the following is the complete factorization of $9r^2 - 16t^2$?
a. $(r - 16t)(r + t)$
b. $3(3r - 3t)(3r + 3t)$
c. $(3r - 4t)(3r + 4t)$
d. $9(r + t^2)$
e. $9(r - t)(r + t)$

____ 2. Which of the following is a factor of $x^2 - 2x - 24$?
a. $(x - 8)$
b. $(x + 2)$
c. $(x - 4)$
d. $(x + 3)$
e. $(x - 6)$

____ 3. Complete the square for the expression $x^2 - 12x +$ ____. Write the resulting expression as a binomial squared.
a. $(x - 6)^2$
b. $(x + 12)^2$
c. $(x + 6)^2$
d. $(x - 12)^2$

____ 4. Find the complex conjugate of $-12i - 6$.
a. $-6 - 12i$
b. $6 + 12i$
c. $-6 + 12i$
d. $6 - 12i$

____ 5. Express $2\sqrt{-72}$ in terms of *i*.

a. $12i\sqrt{2}$
b. $\sqrt{-288}$
c. $-12i\sqrt{2}$
d. $-12\sqrt{2}$

____ 6. Find the absolute value $|-7 - 9i|$.

a. –16
b. $4\sqrt{2}$
c. 4
d. $\sqrt{130}$

____ 7. Subtract. Write the result in the form $a + bi$.
$(5 – 2i) – (6 + 8i)$
a. $11 + 6i$
b. $–3 – 8i$
c. $–1 – 10i$
d. $7 – 2i$

____ 8. Multiply $6i(4 - 6i)$. Write the result in the form $a + bi$.

a. $-36-24i$
b. $36+24i$
c. $-36+24i$
d. $36-24i$

____ 9. Simplify $-8i^{20}$.
a. $8i$
b. 8
c. –8
d. $-8i$

Short Answer

10. Using the graph of $f(x) = x^2$ as a guide, describe the transformations.
$g(x) = (x+3)^2 - 5$

_____

11. Reflect the parent function $f(x) = x^2 + 3$over the x- and y-axis. Write the new function on the line below.

Reflected over the x-axis

_____

Reflected over the y-axis

_____

12. Using the graph of $f(x) = 2x^2 + 7$as a guide, describe the transformation.
$g(x) = 4x^2 + 14$

_____

13. Apply the transformations below in sequence to the parent function $f(x) = x^2$. Show each step.

(A) Vertically Stretch the parent function by a factor of 4 _____

(B) Now, Horizontally translate A two units left _____

(C) Now, Reflect B over the y-axis_____

(D) Now, Vertically translate C one unit up _____

Using the function $f(x) = -x^2 - 4x + 6$, complete the next 6 problems

14. Find the axis of symmetry:

.

15. Find the vertex of the parabola

.

16. Does the parabola open upwards or downward. Using complete sentences explain how you know.

.

17. Does the parabola have a maximum or a minimum. Using complete sentences, explain how you know and identify the value.

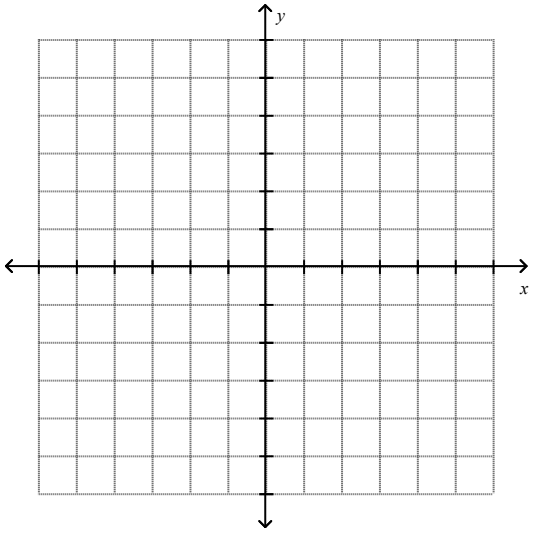
.

18. Find the y-intercept:

.

19. Graph the following equation using the above information and an additional point.

$y = -x^2 - 4x + 6$



20. Factor $x^2 - 3x - 18$

.

21. Factor $16x^2 - 9$

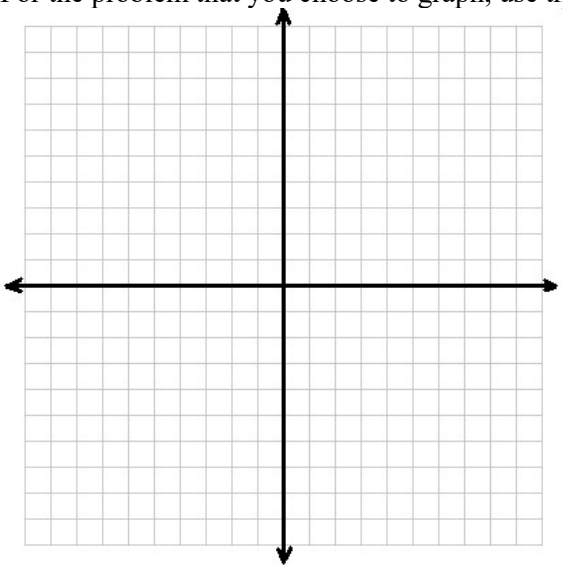
.

22. Write a quadratic function in standard form with zeros 6 and –8.

23. If the area of a square can be represented by $9x^2 - 36x + 36$, how can you represent one of the sides of the square in terms of x?

Find the roots to the following using factoring, the quadratic formula, using square roots, completing the square **or** graphing. You must use each method once. All answers should be in simplest form and no decimals should be given, unless decimal approximation is asked for. **Identify what method you used for each problem and explain why you used that method.**

For the problem that you choose to graph, use the coordinate grid below.



24. $f(x) = x^2 - x - 6$

.

25. $g(x) = 24x^2 + 38x - 36$. Round your answer to the nearest hundredth.

.

26. $s(x) = 2x^2 + 4x + 5$

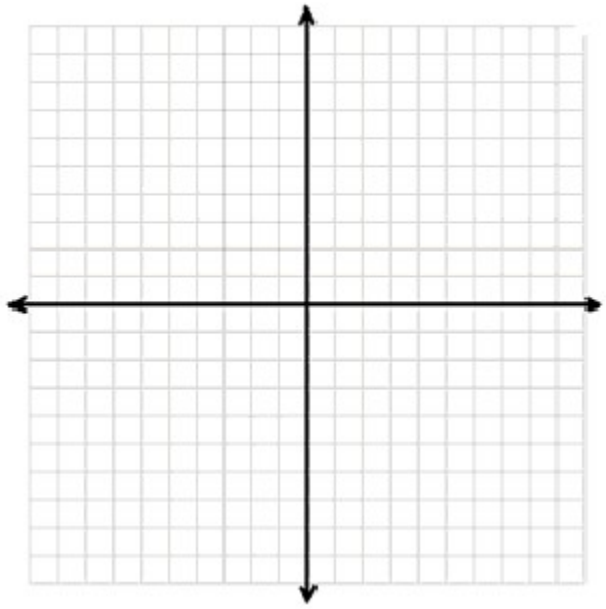
.

27. $5x^2 + 45 = 0$.

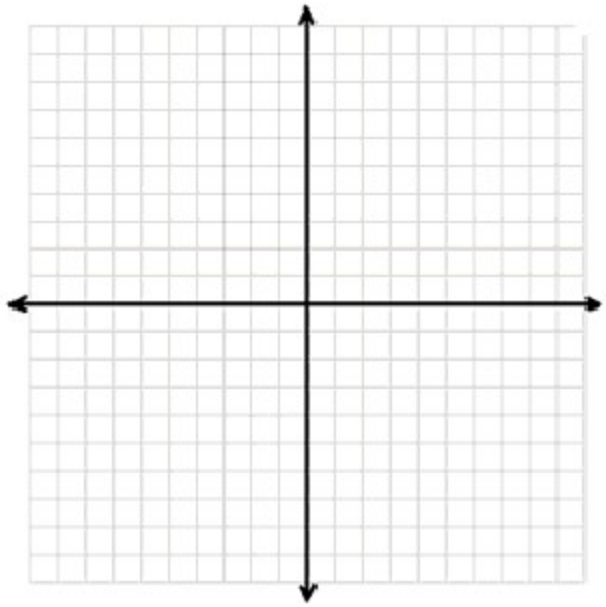
28. $x^2 = 16 - 6x$

29. Find the number and type of solutions for $f(x) = 5x^2 - 8x + 6$

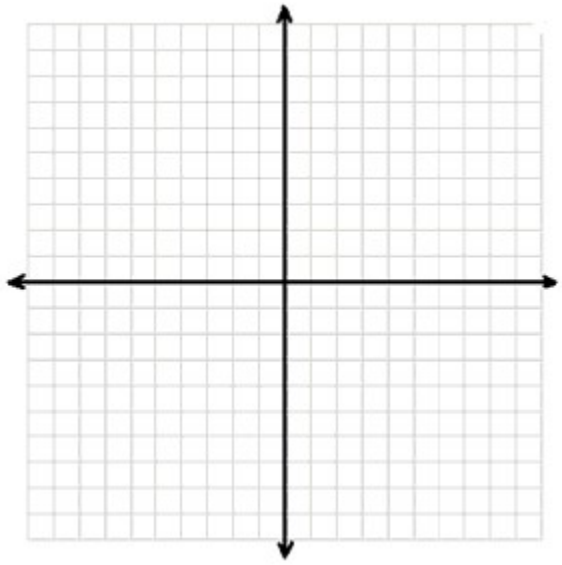
30. Solve the inequality $x^2 + x - 6 \geq -4$ by graphing.



31. Graph $y \leq 5x^2 + 3x + 4$.



32. Graph the complex number $4 + 2i$.



33. Solve the inequality $x^2 + x - 6 \geq -4$. Write to solution in interval notation and draw it on a number line.

34. Simplify $\frac{-2+2i}{5+3i}$.

35. **Challenge (2 points extra credit)**
You must get at least one challenge problem correct to earn over a 90% on this test.
Factor: $-8\pi^2 + 22x\pi - 15x^2$

.

36. **Challenge (2 points extra credit)**
You must get at least one challenge problem correct to earn over a 90% on this test.
Add or Subtract:

$$\frac{x+3}{(x^2+2x-8)}+\frac{x}{x-2}$$

.

37. **Challenge (2 points extra credit)**
You must get at least one challenge problem correct to earn over a 90% on this test.
Expand and simplify $(3-2i^3)^2$

Alg2H - Summative 5
Answer Section

MULTIPLE CHOICE

1. ANS: C PTS: 4 LOC: M37.3b
2. ANS: E PTS: 4 LOC: M37.2d
3. ANS: A

$\left(\frac{-12}{2}\right)^2 = (-6)^2 = 36$ Find $\left(\frac{b}{2}\right)^2$.

$x^2 - 12x + 36$ Add.

$(x-6)^2$ Factor.

	Feedback
A	Correct!
B	Add (*b*/2)^2 to the given expression, then factor.
C	Is *b* positive or negative?
D	Add (*b*/2)^2 to the given expression, then factor.

PTS: 4

4. ANS: C

$-12i - 6 = -6 + (-12)i$ Rewrite as $a + bi$.

$= -6 - (-12)i$ Find $a - bi$.

$= -6 + 12i$ Simplify.

	Feedback
A	This is the number in *a* + *bi* form. Now find the complex conjugate.
B	You changed the sign of both the real and imaginary parts. Only change the sign of the real part.
C	Correct!
D	You changed the sign of the real part. Only change the sign of the imaginary part.

PTS: 4 TOP: Find conjugate of a complex number

5. ANS: A

$2\sqrt{-72}$

$= 2\sqrt{(-1)(72)}$ Factor out –1.

$= 2\sqrt{-1}\sqrt{72}$ Product Property

$= 12\sqrt{2}\sqrt{-1}$ Simplify.

$= 12i\sqrt{2}$ Express in terms of *i*.

	Feedback
A	Correct!
B	Simplify the square root.
C	The imaginary unit is the same as the square root of –1.
D	The imaginary unit is in the solution.

PTS: 4
TOP: Recognize the square root of a negative number as a complex number

6. ANS: D

$\sqrt{(-7)^2 + (-9)^2}$ Find the square root of the sum of the squares of the real and imaginary parts of the complex number.
$\sqrt{130}$ Simplify the square root.

	Feedback
A	Take the square root of the sum of the squares of the real and imaginary parts.
B	Take the square root of the sum of the squares of the real and the imaginary parts.
C	Take the square root of the sum of the squares of the real and imaginary parts.
D	Correct!

PTS: 4

7. ANS: C

To add complex numbers, add the real parts and the imaginary parts. To subtract complex numbers, subtract the real parts and the imaginary parts.
$(5 - 2i) - (6 + 8i) = (5 - (6)) + (-5 - (5))i = -1 - 10i$

	Feedback
A	Check whether you should add or subtract the two complex numbers.
B	Add or subtract real parts and imaginary parts.
C	Correct!
D	Add or subtract real parts and imaginary parts.

PTS: 4

8. ANS: B

$6i(4 - 6i)$

$24i - 36i^2$ Distribute.
$24i - 36(-1)$ Use $i^2 = -1$.
$36 + 24i$ Write in $a + bi$ form.

	Feedback
A	Use the Distributive Property. Then simplify by using the fact that i squared is equal to –1.
B	Correct!
C	Use the Distributive Property. Then simplify by using the fact that i squared is equal to –1.
D	Use the Distributive Property. Then simplify by using the fact that i squared is equal to –1.

PTS: 4

9. ANS: C

$-8i^{20}$

$= -8\left(i^2\right)^{10}$ Rewrite i^{20} as a power of i^2.

$= -8(-1)^{10}$ $i^2 = -1$.

$= -8$ Simplify.

	Feedback
A	If *n* is even, rewrite *i*^*n* as a power of *i*^2. If *n* is odd, rewrite *i*^*n* as a product of *i* and *a* power of i^*2*.
B	If *n* is even, rewrite *i*^*n* as a power of *i*^2. If *n* is odd, rewrite *i*^*n* as a product of *i* and *a* power of i^*2*..
C	Correct!
D	If *n* is even, rewrite *i*^*n* as a power of *i*^2. If *n* is odd, rewrite *i*^*n* as a product of *i* and *a* power of i^*2*.

PTS: 4

SHORT ANSWER

10. ANS:
Vertical Translation/Shift five units down

PTS: 4

11. ANS:
x-Axis
$f(x) = -x^2 - 3$
y-axis
$f(x) = x^2 + 3$

PTS: 4

12. ANS:
Vertical stretch by a factor of 2

PTS: 4

13. ANS:
$f(x) = 4x^2$
$f(x) = 4(x+2)^2$
$f(x) = 4(-x+2)^2$
$f(x) = 4(-x+2)^2 + 1$

PTS: 4

14. ANS:

$$x = \frac{-b}{2a} = \frac{-(-4)}{2(-1)} = \frac{4}{-2} = -2$$

PTS: 4

15. ANS:

$$x = \frac{-b}{2a} = \frac{-(-4)}{2(-1)} = \frac{4}{-2} = -2$$

$$y = -x^2 - 4x + 6$$

$$y = -(-2)^2 - 4(-2) + 6$$

$$y = -4 + 8 + 6$$

$$y = 10$$

Vertex at (-2, 10)

PTS: 4

16. ANS:
The quadratic opens downard because a = -1, which is negative. When a is negative the quadratic opens downward.

PTS: 4

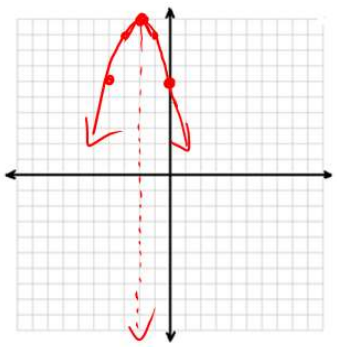
17. ANS:
Max at 10

PTS: 4

18. ANS:
(0, 6)

PTS: 4

19. ANS:



PTS: 4

20. ANS:
$x^2 - 3x - 18 = (x - 6)(x + 3)$

PTS: 4

21. ANS:

$16x^2 - 9 = (4x - 3)(4x + 3)$

PTS: 4

22. ANS:

$f(x) = x^2 + 2x - 48$

$x = 6$ or $x = -8$	Write the zeros as solutions for two equations.
$x - 6 = 0$ or $x + 8 = 0$	Rewrite each equation so that it is equal to 0.
$0 = (x - 6)(x + 8)$	Apply the converse of the Zero-Product Property to write a product that is equal to 0.
$0 = x^2 + 2x - 48$	Multiply the binomials.
$f(x) = x^2 + 2x - 48$	Replace 0 with $f(x)$

PTS: 4

23. ANS:

3x - 6

If the area of a square can be represented by $9x^2 - 36x + 36$, how can you represent one of the sides of the square in terms of x?

(3x - 6) (3x - 6)

PTS: 4

24. ANS:

I. $f(x) = x^2 - x - 6$

x = -3, 2

PTS: 4

25. ANS:

$g(x) = 24x^2 + 38x - 36$

x = 2/3, -9/4

PTS: 4

26. ANS:

$s(x) = 2x^2 + 4x + 5$

$$-1 \pm \frac{\sqrt{6}i}{2}$$

PTS: 4

27. ANS:

$x = \pm 3i$

$5x^2 + 45 = 0$

$5x^2 = -45$	Add -45 to both sides.
$x^2 = -9$	Divide both sides by 5.
$x = \pm\sqrt{-9}$	Take square roots.
$x = \pm 3i$	Express in terms of i.

PTS: 4

28. ANS:
$x = 2$ or $x = -8$

x^2	=	$16 - 6x$	
$x^2 + 6x$	=	16	Collect variable terms on one side.
$x^2 + 6x + \left(\frac{6}{2}\right)^2$	=	$16 + \left(\frac{6}{2}\right)^2$	Add $\left(\frac{b}{2}\right)^2$ to each side.
$x^2 + 6x + 9$	=	25	Simplify.
$(x + 3)^2$	=	25	Factor.
$x + 3$	=	± 5	Take the square root of each side.
$x + 3 = 5$	or	$x + 3 = -5$	Solve for x.
$x = 2$	or	$x = -8$	

PTS: 4

29. ANS:
$b^2 - 4ac$

$(-8)^2 - 4(5)(6)$

-56

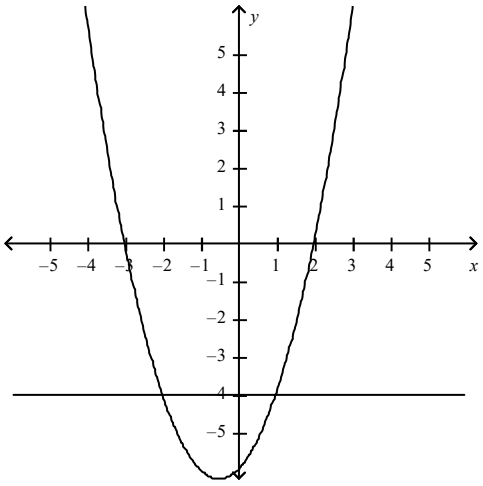
Two imaginary solutions

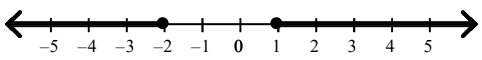
PTS: 4

30. ANS:
$x \le -2$ or $x \ge 1$

Use a graphing calculator to graph each side of the inequality. Use $y_1 = x^2 + x - 6$ and $y_2 = -4$. Identify the values of x for which $y_1 \ge y_2$.

x	y_1	y_2
–3	0	–4
–2	–4	–4
–1	–6	–4
0	–6	–4
1	–4	–4
2	0	–4

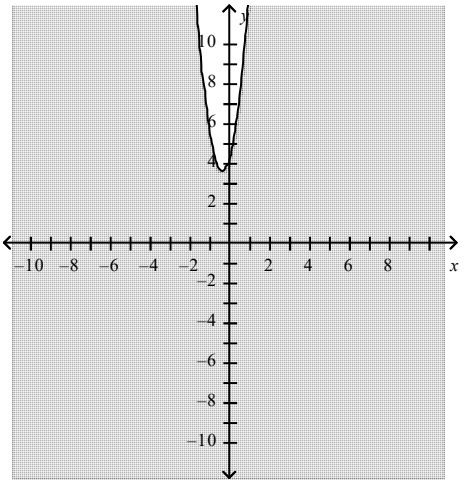




The parabola is at or above the line when x is less than or equal to –2 or greater than or equal to 1. So, the solution set is $x \le -2$ or $x \ge 1$. The table supports the answer. The number line shows the solution set.

PTS: 4

31. ANS:

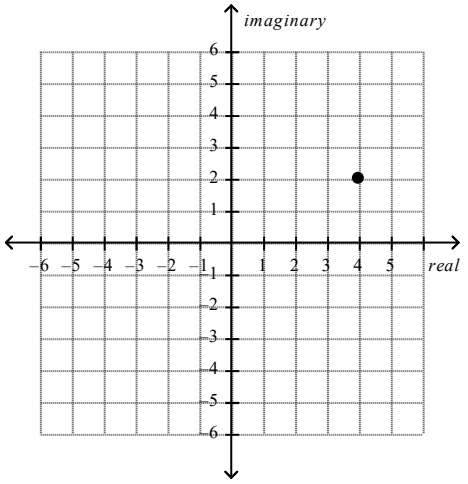


Step 1 Graph the boundary of the related parabola $y = 5x^2 + 3x + 4$ with a dashed line for < or > and a solid line for $\leq$ or $\geq$.
If the coefficient of x^2 is positive, the vertex is the minimum value. If the coefficient of x^2 is negative, the vertex is the maximum value.

Step 2 Shade below the parabola for < or $\leq$ and shade above the parabola for > or $\geq$.

PTS: 4

32. ANS:

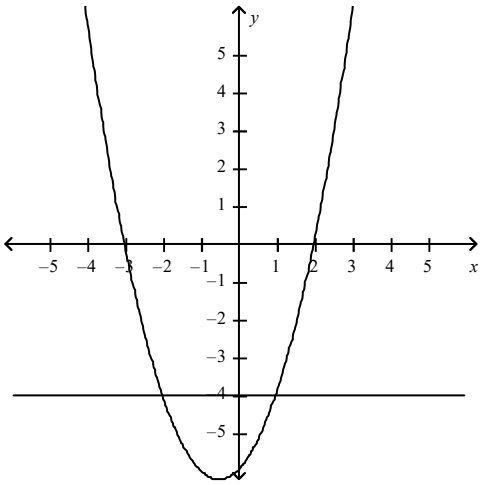


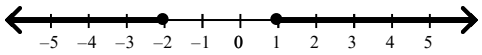
The real axis is the x-axis, and the imaginary axis is the y-axis. Think of $a + bi$ as $x + yi$. Thus the complex number $4 + 2i$ is at $(4, 2)$.

PTS: 4

33. ANS:
$x \leq -2$ or $x \geq 1$
Use a graphing calculator to graph each side of the inequality. Use $y_1 = x^2 + x - 6$ and $y_2 = -4$. Identify the values of x for which $y_1 \geq y_2$.

x	y_1	y_2
–3	0	–4
–2	–4	–4
–1	–6	–4
0	–6	–4
1	–4	–4
2	0	–4





The parabola is at or above the line when x is less than or equal to –2 or greater than or equal to 1. So, the solution set is $x \le -2$ or $x \ge 1$. The table supports the answer. The number line shows the solution set.

PTS: 4

34. ANS:

$-\frac{2}{17} + \frac{8}{17}i$

$\frac{-2+2i}{5+3i}$

$= \frac{(-2+2i)}{(5+3i)} \cdot \frac{(5-3i)}{(5-3i)}$ Multiply by the conjugate.

$= \frac{-10+6i+10i-6i^2}{25-15i+15i-9i^2}$ Distribute.

$= \frac{-10+16i+6}{25+9}$ Use $i^2 = -1$.

$-\frac{2}{17} + \frac{8}{17}i$ Simplify.

PTS: 4

35. ANS:

$-(2\pi - 3x)(4\pi - 5x)$

PTS: 0

36. ANS:

$$\frac{x+3}{(2x^2+x-3)}+\frac{x}{2x-3}$$

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

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

$$=\frac{x^2+3}{2x^2+x-3}$$

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

PTS: 0

37. ANS:

$(3-2i^3)^2$

$(3-2i^3)(3-2i^3)$

$9-6i^3-6i^3+4i^6$

$9-12i^3+4i^6$

$9+12i-4$

$5+12i$

PTS: 0