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CC ALGEBRA 2

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TROICI

REVIEW FOR UNIT 5 TEST: COMPLEX NUMBERS

For #1-10, simplify completely. Write answers in *a + bi* form. **SHOW ALL WORK,** but check in calculator.

1. $3\sqrt{-9}$

$3(3i)$

$\boxed{9i}$

2. $2\sqrt{-18}+4\sqrt{-32}$

$2i\sqrt{9}\sqrt{2} + 4i\sqrt{16}\sqrt{2}$

$2i\cdot 3\sqrt{2} + 4i\cdot 4\sqrt{2}$

$6i\sqrt{2} + 16i\sqrt{2}$

$\boxed{22i\sqrt{2}}$

3. $6i^{45}-5i^{4}+3i^{7}-i^{62}+7i-9$

$6i - 5(1) + 3(-i) - (-1) + 7i - 9$

$6i - 5 - 3i + 1 + 7i - 9$

$10i - 13$

$\boxed{-13+10i}$

4. $(-8-13i)+(3+6i)$

$\boxed{-5-7i}$

5. $(-5+\sqrt{-1})-(5-\sqrt{-4})$

$-5 + i - 5 + 2i$

$\boxed{-10+3i}$

6. $(9-xi)(9+xi)$ CONJUGATE!

$81 - x^2 i^2$

$81 - x^2(-1)$

$\boxed{81+x^2}$

7. $(1+4i)^2$

$(1+4i)(1+4i)$

$1+4i+4i+16i^2$

$1+8i-16$

$\boxed{-15+8i}$

8. $xi(i+3i)^2$

$xi(4i)^2$

$xi(16i^2)$

$xi(-16)$

$\boxed{-16xi}$

9. $i(3-2i)-(3+2i)(4-6i)$

$3i-2i^2 \quad 12-18i+8i+12i^2$

$3i+2-(12-10i+12)$

$3i+2-(24-10i)$

$3i+2-24+10i$

$\boxed{13i-22}$

10. Find the roots of the following equation, in simplest *a* + *bi* form:

Quadratic Formula
$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$$6x^2-6x+10x+10=5x^2-3$$
$$-5x^2 \qquad +3 \quad -5x^2+3$$

$$x^2+4x+13=0$$
$$-13 \quad -13$$

$$x^2+\left(\frac{4}{2}\right)^2x+\boxed{4}=-13+\boxed{4}$$

$$\sqrt{(x+2)^2}=\sqrt{-9}$$

$$x+2=\pm 3i$$
$$-2 \quad -2$$

$$\boxed{x=-2\pm 3i}$$

11. Find the roots of the following equation, in simplest *a*+ *bi* form:

$$2(x^2-x)-2=-7$$

$$2x^2-2x-2=-7$$
$$+7 \quad +7$$

$$2x^2-2x+5=0$$

$a=2$
$b=-2$
$c=5$

$$x=\frac{-(-2)\pm\sqrt{(-2)^2-4(2)(5)}}{2(2)}$$

$$x=\frac{2\pm\sqrt{-36}}{4}$$

$$x=\frac{\overset{1}{2}\pm\overset{3}{6}i}{_{2}\,4}$$

$$\boxed{x=\frac{1\pm 3i}{2}}$$

12. The roots of the equation $0 = ax^2 + bx + c$ if the discriminant is 49 are:

perfect square

a) Real, rational, unequal
b) Real, irrational, unequal
c) Real, rational, equal
d) Imaginary

13. The roots of the equation $x^2 - 2x = 4$ are:

a) Real, rational, unequal
b) Real, irrational, unequal
c) Real, rational, equal
d) Imaginary

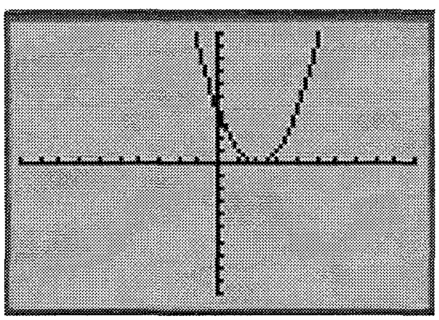
$a = 1$
$b = -2$
$* \; c = -4$

$(-2)^2 - 4(1)(-4)$

20

Not a perfect square!

14. What is the discriminant of the quadratic equation whose graph is shown? Explain how you know and describe the roots.



The discriminant = 0 b/c the parabola only touches the x-axis one time. The roots are real, rational and equal.

15. What is the *smallest* integral value of *c* such that $x^2 + 4x + c = 0$ will have imaginary roots?

< 0!

a. 4 b. 5 c. 6 d. 7

$a = 1$
$b = 4$
$c = c$

$b^2 - 4ac < 0$
$(4)^2 - 4(1)c < 0$
$16 - 4c < 0$

$-4c < -16$
$c > 4$

16. For what value of *c* does $x^2 - 6x + c = 0$ have equal roots?

$= 0$

$a = 1$
$b = -6$
$c = c$

$(-6)^2 - 4(1)(c) = 0$
$36 - 4c = 0$
$36 = 4c$
$\boxed{c = 9}$

17. The expression $(x+2i)^2-(x-3i)^2$ is equivalent to: (~~Use calc: store a # for x~~)

a) 0 b) -8 c) 5 + 10*xi* d) -13 – 2xi

$(x+2i)(x+2i)$ $(x-3i)(x-3i)$

$x^2+2xi+2xi+4i^2$ $\cancel{x^2-3xi-3xi+9i^2}$

$\cancel{x^2}+4xi-4$ $-(\cancel{x^2}+6xi+9)$ $10xi+5$

18. Which of the following equations has $6+2i$ as a root? (use calc: store $6+2i$ as x and plug in choices)

a. $x^2 + 12x - 40 = 0$

c. $x^2 - 6x + 2 = 0$

b. $x^2 - 12x + 40 = 0$ ✓

d. $x^2 + 6x - 2 = 0$

$(6+2i)^2 - 12(6+2i)+40$

$(6+2i)(6+2i)$ $-72-\cancel{24i}+40$

$36+12i+12i+4i^2$

$36+24i-4$ $\boxed{0}$

$32+\cancel{24i}$

19. Given the equation f(*x*) = $x^3 + 4x^2 + 9x + 36$, answer the following questions:

a. What is the degree of f(*x*)? 3

b. How many total solutions will *f*(x) have? 3

c. Find all solutions when f(*x*) = 0.

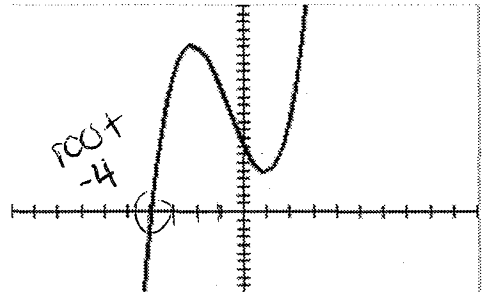
$x^3+4x^2+9x+36$

$x^2(x+4)$ $+9(x+4)$

$(x^2+9)(x+4)$

$\{\pm 3i, -4\}$

20. Given the graph of: $f(x) = x^3 + 2x^2 - 6x + 8$.



a. Based on the graph, what is the real solution to the equation $f(x) = x^3 + 2x^2 - 6x + 8$? ___3___

b. How many real and how many complex solutions are there? ___1___ real ___2___ complex

c. What linear factor does this solution come from? $(x+4)$

d. Using the linear factor, find the two complex number solutions of $f(x)$.

$$\begin{array}{r|l} & x^2 - 2x + 2 \\ \hline x+4 & x^3 + 2x^2 - 6x + 8 \\ & -x^3 - 4x^2 \\ \hline & -2x^2 - 6x \\ & +2x^2 + 8x \\ \hline & 2x + 8 \\ & -2x - 8 \\ \hline & 0 \end{array}$$

$$x^2 - 2x + 2 = 0$$
$$-2 \quad -2$$
$$x^2 - 2x + \boxed{1} = -2 + \boxed{1}$$
$$\left(\frac{2}{2}\right)^2$$
$$\sqrt{(x-1)^2} = \sqrt{-1}$$
$$x - 1 = \pm i$$
$$+1 \quad +1$$
$$\boxed{x = 1 \pm i}$$

21. What are solutions to $x^4 - 64x = 0$?

a) $\{0, \pm 8\}$ b) $\{0, 4, -2 \pm 2i\sqrt{3}\}$ c) $\{0, \pm 2\}$ d) $\{4, \pm 2i\}$

$(a+b)(a^2+ab+b^2)$

$x(x^3 - 64) = 0$

$x(x-4)(x^2+4x+16) = 0$

0 | 4 | $x^2 + \left(\frac{4}{2}\right)^2 x + \boxed{4} = -16 + \boxed{4}$

$\sqrt{(x+2)^2} = \sqrt{-12}$

$x + 2 = \pm 2i\sqrt{3}$

$x = -2 \pm 2i\sqrt{3}$

22. Solve for x: $x^3 + 9x = 0$

$x(x^2 + 9) = 0$

$x = 0$ | $\sqrt{x^2} = \sqrt{-9}$

$x = \pm 3i$

$\{0, \pm 3i\}$

23. The graph of f(x) is shown to the right.

Which of the following is the factored form of the equation?

(1) $f(x) = (x-3)(x+2)(x+6)$

(2) $f(x) = x(x+3)(x-2)^2(x-6)$

(3) $f(x) = (x+3)(x-2)(x-6)$

(4) $f(x) = (x+3)(x-2)(x-6)^2$