Name: ________________________ Class: ___________________ Date: __________ ID: A

Algebra 2 Section 6.6 Practice Quiz

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

____ 1. Write the simplest polynomial function with zeros –2, 7, and $-\frac{1}{2}$.

a. $P(x) = x^3 - \frac{9}{2}x^2 + \frac{9}{2}x - 7$
b. $P(x) = x^3 + \frac{9}{2}x^2 + \frac{9}{2}x + 7$
c. $P(x) = x^4 - \frac{7}{2}x^3 + 0x^2 - \frac{5}{2}x - 7$
d. $P(x) = x^3 - 2x^2 + 7x - \frac{1}{2}$

____ 2. Solve $x^4 - 3x^3 - x^2 - 27x - 90 = 0$ by finding all roots.

a. The solutions are 5 and –2.
b. The solutions are 5, –2, $3i$, and $-3i$.
c. The solutions are –3, –1, –27, and –90.
d. The solutions are –5, 2, $3i$, and $-3i$.

____ 3. Write the simplest polynomial function with the zeros $2 - i$, $\sqrt{5}$, and –2.

a. $P(x) = x^5 - 2x^4 - 8x^3 + 20x^2 + 15x - 50 = 0$
b. $P(x) = x^5 - 2x^4 - 10x^3 + 16x^2 + 25x - 30 = 0$
c. $P(x) = x^5 - 2x^4 - 8x^3 - 20x^2 - 65x - 50 = 0$
d. $P(x) = x^6 - 4x^5 - 4x^4 + 36x^3 - 25x^2 - 80x + 100 = 0$

____ 4. A sugar cone packed with ice cream and topped with a scoop of ice cream is shaped approximately like a cone with hemispherical top. If the height of the sugar cone is 10 cm and the volume of ice cream is 96π cubic centimeters, find the radius of the sugar cone.

a. 5 cm
b. 4 cm
c. 3 cm
d. 5.5 cm

____ 5. What polynomial function has zeros 1, $1 + i$, and $1 - i$?

a. $P(x) = x^3 - 4x^2 + 3x - 1$
b. $P(x) = x^3 + 2x^2 - 3x - 3$
c. $P(x) = x^3 - 3x^2 + 4x - 2$
d. $P(x) = x^3 - x^2 + 2x + 1$

Algebra 2 Section 6.6 Practice Quiz
Answer Section

MULTIPLE CHOICE

1. ANS: A

$P(x) = 0$	
$P(x) = (x + 2)(x - 7)(x + \frac{1}{2})$	If r is a zero of $P(x)$, then $x - r$ is a factor of $P(x)$.
$P(x) = (x^2 - 5x - 14)(x + \frac{1}{2})$	Multiply the first two binomials.
$P(x) = x^3 - \frac{9}{2}x^2 + \frac{9}{2}x - 7$	Multiply the trinomial by the binomial.

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2. ANS: B

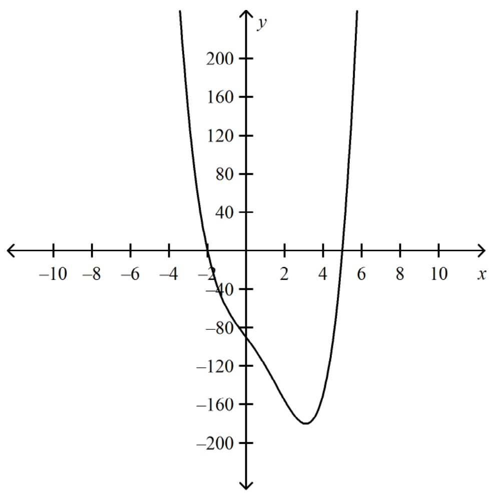
The polynomial is of degree 4, so there are four roots for the equation.

Step 1: Identify the possible rational roots by using the Rational Root Theorem.

$$\frac{\pm 1, \pm 2, \pm 3, \pm 5, \pm 6, \pm 9, \pm 10, \pm 15, \pm 18 \pm 30, \pm 45, \pm 90}{\pm 1}$$

$p = -90$ and $q = 1$

Step 2: Graph $x^4 - 3x^3 - x^2 - 27x - 90 = 0$ to find the locations of the real roots.



The real roots are at or near 5 and –2.

Step 3: Test the possible real roots.

Test the possible root of 5:	Test the possible root of –2:
$\begin{array}{r\|rrrrr} 5 & 1 & -3 & -1 & -27 & -90 \\ & & 5 & 10 & 45 & 90 \\ \hline & 1 & 2 & 9 & 18 & 0 \end{array}$	$\begin{array}{r\|rrrrr} -2 & 1 & -3 & -1 & -27 & -90 \\ & & -2 & 10 & -18 & 90 \\ \hline & 1 & -5 & 9 & -45 & 0 \end{array}$

The polynomial factors into $(x-5)(x+2)(x^2+9) = 0$.

Step 4: Solve $x^2 + 9 = 0$ to find the remaining roots.

$x^2 + 9 = 0$

$x^2 = -9$

$x = \pm 3i$

The fully factored equation is $(x-5)(x+2)(x+3i)(x-3i) = 0$.

The solutions are 5, –2, $-3i$, and $3i$.

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3. ANS: A

   There are five roots: $2-i$, $2+i$, $\sqrt{5}$, $-\sqrt{5}$, and -2. (By the Irrational Root Theorem and Complex Conjugate Root Theorem, irrational and complex roots come in conjugate pairs.) Since it has 5 roots, the polynomial must have degree 5.

   Write the equation in factored form, and then multiply to get standard form.

   $P(x) = 0$

   $(x-(2-i))(x-(2+i))(x-\sqrt{5})(x-(-\sqrt{5}))(x-(-2)) = 0$

   $(x^2-4x+5)(x^2-5)(x+2) = 0$

   $(x^4-4x^3+20x-25)(x+2) = 0$

   $P(x) = x^5-2x^4-8x^3+20x^2+15x-50 = 0$

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4. ANS: B

   Write an equation to represent the volume of ice cream. Note that the hemisphere and the cone have the same radius, x.

   $V = V_{cone} + V_{hemisphere}$

   $$\begin{aligned} V_{cone} &= \tfrac{1}{3}\pi x^2 h \\ &= \tfrac{1}{3}\pi x^2(10) \\ &= \tfrac{10}{3}\pi x^2 \end{aligned} \qquad \begin{aligned} V_{hemisphere} &= \tfrac{1}{2}V_{sphere} \\ &= \tfrac{1}{2}\left(\tfrac{4}{3}\pi x^3\right) \\ &= \tfrac{2}{3}\pi x^3 \end{aligned}$$

   So,

   $V(x) = \frac{10}{3}\pi x^2 + \frac{2}{3}\pi x^3$

   $96\pi = \frac{10}{3}\pi x^2 + \frac{2}{3}\pi x^3$ Set the volume equal to 96π.

   $0 = \frac{2}{3}\pi x^3 + \frac{10}{3}\pi x^2 - 96\pi$ Write in standard form.

   $0 = 2x^3 + 10x^2 - 288$ Multiply both sides by $\frac{3}{\pi}$.

   The graph indicates a possible positive root of 4. Use synthetic division to verify that 4 is a root, and write the equation as $(x-4)(2x^2+18x+72)$. Since the discriminant of $2x^2+18x+72$ is -252, the roots of $2x^2+18x+72$ are complex. The radius must be a positive real number, so the radius of the sugar cone is 4 cm.

   PTS: 1 REF: Page 447

5. ANS: C

$P(x) = 0$

$(x-1)[x-(1+i)][x-(1-i)] = 0$	If r is a root of $P(x)$, then $x-r$ is a factor of $P(x)$.
$(x-1)(x-1-i)(x-1+i) = 0$	Distribute.
$(x-1)(x^2 - x + xi - x + 1 - i - ix + i + 1) = 0$	Multiply the trinomials. Use $-i^2 = 1$.
$(x-1)(x^2 - 2x + 2) = 0$	Combine like terms.
$x^3 - 2x^2 + 2x - x^2 + 2x - 2 = 0$	Multiply the binomial and trinomial.
$x^3 - 3x^2 + 4x - 2 = 0$	Combine like terms.

PTS: 1