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ALGEBRA II

REGENTS EXAM
REVIEW MANUAL

WITH 8 REGENTS EXAMS,
6 TOPICALLY ORGANIZED

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Production

Algebra II
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Polynomial Expressions and Equations

1. Evaluate $j(-1)$ given
    $j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$.
    Explain what your answer tells you about
    $x + 1$ as a factor.

    Algebraically find the remaining zeros of $f(x)$.

2. Over the set of integers, factor the expression

    $x^4 - 4x^2 - 12$.

3. Which expression is equivalent to
    $x^6 y^4 (x^4 - 16) - 9(x^4 - 16)$?

    1) $x^{10} y^4 - 16x^6 y^4 - 9x^4 - 144$

    2) $(x^6 y^4 - 9)(x + 2)^3 (x - 2)$

    3) $(x^3 y^2 + 3)(x^3 y^2 - 3)(x + 2)^2 (x - 2)^2$

    4) $(x^3 y^2 + 3)(x^3 y^2 - 3)(x^2 + 4)(x^2 - 4)$

4. The roots of the equation $3x^2 + 2x = -7$ are

1) $-2, -\dfrac{1}{3}$

3) $-\dfrac{1}{3} \pm \dfrac{2i\sqrt{5}}{3}$

2) $-\dfrac{7}{3}, 1$

4) $-\dfrac{1}{3} \pm \dfrac{\sqrt{11}}{3}$

5. Which expression is equivalent to

$$\dfrac{2x^4 + 8x^3 - 25x^2 - 6x + 14}{x + 6}?$$

1) $2x^3 + 4x^2 + x - 12 + \dfrac{86}{x+6}$

2) $2x^3 - 4x^2 - x + 14$

3) $2x^3 - 4x^2 - x + \dfrac{14}{x+6}$

4) $2x^3 - 4x^2 - x$

6.   Consider the function $p(x) = 3x^3 + x^2 - 5x$ and the graph of $y = m(x)$ below.
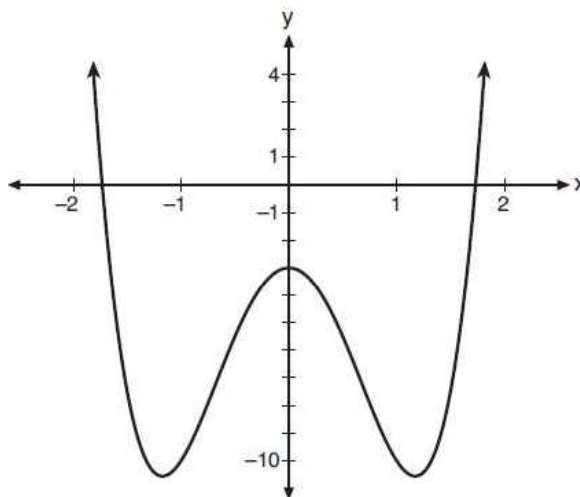
Which statement is true?

1) $p(x)$ has three real roots and $m(x)$ has two real roots.

3) $p(x)$ has two real roots and $m(x)$ has three real roots.

2) $p(x)$ has one real root and $m(x)$ has two real roots.

4) $p(x)$ has three real roots and $m(x)$ has four real roots.

7.   If $f(x) = x^2 + 9$ and $g(x) = x + 3$, which operation would not result in a polynomial expression?

1) $f(x) + g(x)$

3) $f(x) \bullet g(x)$

2) $f(x) - g(x)$

4) $f(x) \div g(x)$

8. Determine the quotient and remainder When $(6a^3 + 11a^2 - 4a - 9)$ is divided by $(3a - 2)$.

Express your answer in the form $q(a) + \dfrac{r(a)}{d(a)}$.

9. Given the following polynomials

$$x = (a + b + c)^2$$
$$y = a^2 + b^2 + c^2$$
$$z = ab + bc + ac$$

Which identity is true?

1) $x = y - z$ 3) $x = y - 2z$

2) $x = y + z$ 4) $x = y + 2z$

10. Which equation represents a parabola with a focus of $(-2, 5)$ and a directrix of $y = 9$?

1) $(y - 7)^2 = 8(x + 2)$ 3) $(x + 2)^2 = 8(y - 7)$

2) $(y - 7)^2 = -8(x + 2)$ 4) $(x + 2)^2 = -8(y - 7)$

11. The profit function, $p(x)$, for a company is the cost function, $c(x)$, subtracted from the revenue function, $r(x)$. The profit function for the Acme Corporation is $p(x) = -0.5x^2 + 250x - 300$ and the revenue function is $r(x) = -0.3x^2 + 150x$.

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    The cost function for the Acme Corporation is

    1) $c(x) = 0.2x^2 - 100x + 300$ 3) $c(x) = -0.2x^2 + 100x - 300$

    2) $c(x) = 0.2x^2 + 100x + 300$ 4) $c(x) = -0.8x^2 + 400x - 300$

12. If $x - 1$ is a factor of $x^3 - kx^2 + 2x$, what is the value of k?

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    1) 0   3) 3

    2) 2   4) -3

13. Which expression can be rewritten as $(x+7)(x-1)$?

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    1) $(x+3)^2 - 16$

    2) $(x+3)^2 - 10(x+3) - 2(x+3) + 20$

    3) $\dfrac{(x-1)(x^2 - 6x - 7)}{(x+1)}$

    4) $\dfrac{(x+7)(x^2 + 4x + 3)}{(x+3)}$

14. The graphs of the equations $y = x^2 + 4x - 1$ and $y + 3 = x$ are drawn on the same set of axes. One solution of this system is

    1) $(-5, -2)$ 3) $(1, 4)$

    2) $(-1, -4)$ 4) $(-2, -1)$

15. On a set of axes, sketch a possible Function $p(x) = (x - a)(x - b)(x + c)$, where a, b, and c are positive, $a > b$, and $p(x)$ has a positive y-intercept of d. Label all intercepts.

16. Verify the following Pythagorean identity for all values of x and y:

    $$(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$$

17. Which binomial is *not* a factor of the expression $x^3 - 11x^2 + 16x + 84$?

    1) $x + 2$ 3) $x - 6$

    2) $x + 4$ 4) $x - 7$

18. Which expression has been rewritten correctly to form a true statement?

    1) $(x+2)^2 + 2(x+2) - 8 = (x+6)x$

    2) $x^4 + 4x^2 + 9x^2y^2 - 36y^2 = (x+3y)^2(x-2)^2$

    3) $x^3 + 3x^2 - 4xy^2 - 12y^2 = (x-2y)(x+3)^2$

    4) $(x^2-4)^2 - 5(x^2-4) - 6 = (x^2-7)(x^2-6)$

19. Which expression is equivalent to

    $\dfrac{4x^3 + 9x - 5}{2x - 1}$, where $x \neq \dfrac{1}{2}$?

    1) $2x^2 + x + 5$ 　　　　 3) $2x^2 - x + 5$

    2) $2x^2 + \dfrac{11}{2} + \dfrac{1}{2(2x-1)}$ 　 4) $2x^2 - x + 4 + \dfrac{1}{2x-1}$

20. A polynomial equation of degree three, $p(x)$, is used to model the volume of a rectangular box. The graph of $p(x)$ has x intercepts at -2, 10, and 14. Which statements regarding $p(x)$ could be true?

    A. The equation of $p(x) = (x-2)(x+10)(x+14)$.

    B. The equation of $p(x) = -(x+2)(x-10)(x-14)$.

    C. The maximum volume occurs when $x = 10$.

    D. The maximum volume of the box is approximately 56.

1) A and C 3) B and C

2) A and D 4) B and D

21. What are the zeros of $P(m) = (m^2 - 4)(m^2 + 1)$?   08 2017 08

    1) 2 and -2, only   3) $-4, i,$ and $-i$

    2) $2, -2,$ and -4 4) $2, -2, i,$ and $-i$

22. Which equation represents a parabola with the focus at $(0, -1)$ and the directrix of $y = 1$?   08 2017 06

    1) $x^2 = -8y$ 3) $x^2 = 8y$

    2) $x^2 = -4y$ 4) $x^2 = 4y$

23. Over the set of integers, factor the expression $4x^3 - x^2 + 16x - 4$ completely.   06 2017 27

24. Given $r(x) = x^3 - 4x^2 + 4x - 6$, find the value of $r(2)$. What does your answer tell you about $x - 2$ as a factor of $r(x)$? Explain.   06 2017 25

25. The expression $\dfrac{-3x^2 - 5x + 2}{x^3 + 2x^2}$ can be rewritten as

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1) $\dfrac{-3x - 3}{x^2 + 2x}$

3) $-3x^{-1} + 1$

2) $\dfrac{-3x - 1}{x^2}$

4) $-3x^{-1} + x^{-2}$

26. Mallory wants to buy a new window air conditioning unit. The cost for the unit is $329.99. If she plans to run the unit three months out of the year for an annual operating cost of $108.78, which function models the cost per year over the lifetime of the unit, $C(n)$, in terms of the number of years, n, that she owns the air conditioner.

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1) $C(n) = 329.99 + 108.78n$

2) $C(n) = 329.99 + 326.34n$

3) $C(n) = \dfrac{329.99 + 108.78n}{n}$

4) $C(n) = \dfrac{329.99 + 326.34n}{n}$

27. A parabola has its focus at $(1, 2)$ and its directrix is $y = -2$. The equation of this parabola could be

    06 2017 17

    1) $y = 8(x + 1)^2$

    2) $y = \frac{1}{8}(x + 1)^2$

    3) $y = 8(x - 1)^2$

    4) $y = \frac{1}{8}(x - 1)^2$

28. Which binomial is a factor of
    $x^4 - 4x^2 - 4x + 8$?

    06 2017 11

    1) $x - 2$ 3) $x - 4$

    2) $x + 2$ 4) $x + 4$

29. A manufacturing company has developed a cost model, $C(x) = 0.15x^3 + 0.01x^2 + 2x + 120$, where x is the number of items sold, in thousands. The sales price can be modeled by $S(x) = 30 - 0.01x$. Therefore, revenue is modeled by $R(x) = x \bullet S(x)$. The company's profit, $P(x) = R(x) - C(x)$, could be modeled by

    06 2017 09

    1) $0.15x^3 + 0.02x^2 - 28x + 120$

    2) $-0.15x^3 - 0.02x^2 + 28x - 120$

    3) $-0.15x^3 + 0.01x^2 - 2.01x - 120$

    4) $-0.15x^3 + 32x + 120$