Math 1314 Final Exam Review Problems
Spring 2019

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1. Solve the equation by factoring and applying the zero product property.

   (a) $3x^2 + 14x - 49 = 0$

   (b) $24x^2 + 6 = 24x$

   (c) $(n + 5)(n - 7) = 28$

   (d) $10m(m + 3) = 3m - 5$

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2. Use the Square Root Property to solve the equation.

   (a) $16x^2 = 17$

   (b) $(k + 6)^2 = 28$

   (c) $12x^2 + 48 = 0$

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3. Determine the value of n that makes the polynomial a perfect square. Then write the polynomial as the square of a binomial.

   (a) $p^2 + 22p + n$

   (b) $u^2 - 19u + n$

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

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4. Solve by completing the square.

   (a) $x^2 + 14x - 5 = 0$

   (b) $8x^2 + 3x - 32 = 0$

   (c) $4y^2 + 8y = 11$

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5. Use the quadratic formula to solve the equation

   (a) $2x(x + 3) = -1$

   (b) $(3x - 2)(x - 1) = -3$

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6. Solve the equation using any method

$$\frac{5}{x-4} - \frac{8}{x+1} = \frac{34}{x^2-3x-4}$$

7. Solve for the indicated variable.

   (a) $A = \pi r^2 h$ for $r > 0$

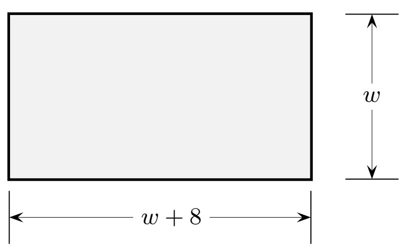
   (b) $kw^2 - cw = r$ for $w > 0$

8. Solve the equations. For each equation, find the ***sum of the solutions***.

   (a) $\sqrt{6x+7} - 2x = 3$

   (b) $\sqrt{2x+3} - \sqrt{x-2} = 2$

9. A rectangle has an area of 105 yds^2. The length of the rectangle is 8 yds more than its width w. Find the ***perimeter*** P of the rectangle.



10. The length of the longer leg of a right triangle is 14 ft longer than the length of the shorter leg x. The hypotenuse is 6 ft longer than twice the length of the shorter leg. Find the dimensions of the triangle.

11. Solve the equation $4x^{2/3} - 9x^{1/3} = 9$. Find the ***product*** of the solutions.

12. Solve the equation $(x-3)^4 - 5(x-3)^2 + 4 = 0$. Find the ***product*** of the solutions.

13. Solve the *absolute-value* equations. For each equation, find the ***sum*** S of the solutions.

    (a) $|8x-3| - 12 = 4$.

    (b) $|5x+4| = |x+9|$.

14. Solve the following inequalities. Write the solution sets in interval notation.

    (a) $(x-4)(5x-8) > 0$

    (b) $\dfrac{(x-4)(5x-8)}{x-15} < 0$

    (c) $\dfrac{x-4}{x-15} < 2$

15. Solve the absolute value inequalities. Write the solution sets in interval notation.

    (a) $|5x - 12| - 4 \geq 20$

    (b) $|4x - 9| < 10$

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16. Let $P(3, -8)$ and $Q(-2, 5)$ be given points.

    (a) Use the ***distance formula*** to find the exact distance between P and Q.

    (b) Find the ***midpoint*** of the line segment whose endpoints are the given points P and Q.

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17. Write the given equation in the form $(x - h)^2 + (y - k)^2 = r^2$. Identify the center and radius.

    $2x^2 + 2y^2 + 16x - 20y + 50 = 0$

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18. The endpoints of the diameter of a circle are $(-2, 3)$ and $(-10, 9)$. Write an equation of this circle in standard form and identify its center and radius.

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19. Find an equation for the line with the given property. Write the equations in slope-intercept form.

    (a) Perpendicular to the line $x - 5y = 3$ and containing the point $(5, 3)$.

    (b) Parallel to the line $2x - 5y = 3$ and containing the point $(5, 3)$.

    (c) Containing the points $(5, 3)$ and $(-1, 8)$.

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20. Find the domain of each function. Write the domain using interval notation.

    (a) $f(x) = \dfrac{5x - 4}{x + 3}$ (b) $g(x) = \dfrac{5x}{\sqrt{x + 3}}$ (c) $h(x) = \dfrac{x - 4}{|x + 3|}$

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21. Determine if each function is ***even***, ***odd***, or neither.

    (a) $f(x) = -x^5 + x^3$ (b) $g(x) = x^2 - |x| + 1$ (c) $h(x) = 5x^2 + 3x$

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22. Determine if the graph of each equation is ***symmetric*** with respect to the x-axis, y-axis, origin, or none of these.

    (a) $y = -x^2 + 3$ (b) $x = -|y| + 4$ (c) $y = x^2 + 5x + 1$ (d) $x^2 - y^2 = 5$.

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23. Define the function f by

$$f(x) = \begin{cases} 10x + 2 & \text{if } x \geq 6, \\ 5x - 6 & \text{if } -3 \leq x < 6, \\ x^2 - 2 & \text{if } x < -3. \end{cases}$$

    Evaluate:

    (a) $f(-4) + f(5)$ (b) $f(0)$ (c) $f(6)$

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24. Solve the problem.

    If $f(x) = \dfrac{3x - B}{x - A}$, $f(3) = 0$, and $f(-6)$ is undefined, what are the values of A and B?

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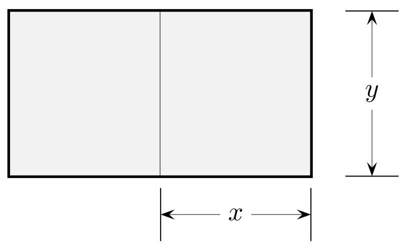
25. Two chicken coops are to be built adjacent to one another from 120 ft of fencing.

    (a) What dimensions x and y should be used to maximize the area of an individual coop?

    (b) What is the maximum area of an individual coop?

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26. Determine the ***end behavior*** of the graph of each polynomial functions given below.

    (a) $f(x) = -4x^5 + 6x^3 + 2x$ (b) $g(x) = 5x(2x - 3)^3(x + 2)^2$ (c) $h(x) = -8x^4 - 5x^3 - 1$

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27. Evaluate the function for the indicated value, then simplify as much as possible.

    $f(x) = x^2 - 3x + 5$. Find $f(x + 1)$.

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28. Find $\dfrac{f(x+h) - f(x)}{h}$ for the following function f.

    $f(x) = x^2 - 3x + 5$.

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29. For the given functions f and g, find $(f \cdot g)(x)$.

    $f(x) = \dfrac{x - 1}{x^2 - 25}$, $g(x) = \dfrac{x + 5}{1 - x}$

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30. For the given functions f and g, find $\left(\dfrac{f}{g}\right)(-2)$.

    $f(x) = -6x + 1$, $g(x) = x^2$

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31. For the given functions f and g, find and simplify the ***composite*** functions.

    (a) $(f \circ g)(x)$.

    (b) $(g \circ f)(x)$.

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

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32. Describe, with graph transformations, how the graph of $f(x) = (x-2)^2 + 5$ relates to the graph of the parent function $g(x) = x^2$.

33. Form a polynomial $f(x)$ with real coefficients having the given degree and zeros.

    degree: 4; zeros: -1, 2, and $1 - 2i$.

34. Use the **Rational Zeros Theorem** to find all the real zeros of the polynomial function. Use the zeros to factor f over the real numbers.

    $f(x) = 4x^3 - 11x^2 - 6x + 9$

35. Use the **Rational Zeros Theorem** to list all the possible rational zeros of the polynomial function. Do not find the actual zeros.

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

36. Solve the problem.

    Find m so that $x + 4$ is a factor of $5x^3 + 18x^2 + mx + 16$.

37. Find the ***average rate of change*** of the function f from $x_1 = 1$ to $x_2 = 5$, where $f(x) = 4x^2 - 6x + 1$

38. Find the ***vertical asymptotes*** (VA) and ***horizontal asymptotes*** (HA), if any, for each function.

    (a) $f(x) = \dfrac{x-1}{x^2-25}$ (b) $g(x) = \dfrac{3x-7}{5x+12}$ (c) $h(x) = \dfrac{x^2-4}{x+1}$

39. Find the zeros of the polynomial function and state the multiplicity of each zero.

    $f(x) = 10x(x-1)^4(x+3)^2$

40. If the vertex of the parabola $y = 4x^2 - 5x + 10$ is the point (h, k), what is the value of k?

41. Find the inverse function of the function f, if it exists, where

    (a) $f(x) = -12x + 5$.

    (b) $f(x) = (x-1)^3 + 4$.

42. Use the Remainder Theorem and synthetic division to find $f(k)$, where

    $k = \frac{1}{2}$ and $f(x) = 4x^3 - 7x^2 + 5x - 3$

43. Divide the polynomials using *synthetic division.*

    $$\frac{3x^4 - 5x^2 + 15x + 2}{x - 2}$$

44. Divide the polynomials using *long division.*

$$\frac{3x^4 - 2x^3 - 5x^2 + 15x + 2}{x^2 - 3}$$

45. Solve the nonlinear system . Provide the product P of the y-values of the solutions and the sum S of the x-values of the solutions.

$$x^2 - xy = 20$$
$$x - 2y = 3$$

46. Solve the system of equations using Gaussian elimination.

$$\begin{aligned} x - 3y - 2z &= 0 \\ 2x - 7y - 6z &= 7 \\ 4x + 5y + 2z &= 1 \end{aligned}$$

Then compute the ***sum*** $S = x + y + z$ of the solution (x, y, z) of the system.

47. Write the expression $\log_3\left(\frac{r\sqrt[3]{ab}}{c^5}\right)$ as a sum, difference, or product of logarithms.

Assume that all variables represent positive real numbers.

48. Suppose $\log_x 8 = B$, where B is a positive real number and $x > 0$. Solve for x as a function of B.

Find a value of B such that the solution x of the equation $\log_x 8 = B$ is a positive integer.

49. Let $f(x) = \log_5(x + 3)$.

(a) Write the domain and range of f in interval notation.

(b) Determine the vertical asymptote of f.

50. Solve the logarithmic equation $2 + \log_3(2x + 5) - \log_3 x = 4$.

If the reciprocal of the solution is written as a reduced fraction $\frac{n}{m}$ (where n and m are integers whose greatest common factor is 1), what is the value of m?

51. Solve the logarithmic equations. For each equation, find the sum S of all solutions. (Note: If there is only one solution $x = a$ for a given equation, then $S = a$ for that equation.)

(a) $\log_3(x + 5) + \log_3(x - 3) = 2$.

(b) $\log_2(x - 4) + \log_2(10 - x) = 3$

52. Solve the exponential equations.

    (a) $4e^{(3x+2)} = 2.$

    (b) $7^{(3x+2)} - 15 = -3.$

    For each equation, express the solution set in terms of the natural logarithm.

53. Solve the exponential equation.

    $16^{(3x+2)} = 4^{(5x-8)}.$

54. Solve for x.

    $$\begin{vmatrix} x & 5 \\ -2 & 8 \end{vmatrix} = 12$$

55. Use the given matrices to compute the given expression.

    Let $\mathrm{M} = \begin{bmatrix} 5 & 6 \\ -2 & 0 \end{bmatrix} \qquad \mathrm{N} = \begin{bmatrix} 1 & -2 \\ 5 & 3 \end{bmatrix}$

    Find $4\mathrm{M} - 3\mathrm{N}$.