Name: Key

Pre Calculus Honors Review for 1st Semester Final

Multiple Choice

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

1. **Solve the equation.**
   $3p - 1 = 5(p - 1) - 2(7 - 2p)$
   a. 3
   b. 0
   c. –9
   d. –10

2. **Solve the inequality.**
   $-5.3 \geq 6.7 + 4.3 + q$
   a. $-15.3 \geq q$
   b. $16.3 \geq q$
   c. $15.3 \geq q$
   d. $-16.3 \geq q$

3. **Solve the inequality.**
   $12x - 3x + 11 > 4x - (17 - 9x)$
   a. $x > -7$
   b. $x < 7$
   c. $x < -\frac{14}{11}$
   d. $x > -\frac{14}{11}$

4. **Write a function rule for the table.**

x	$f(x)$
2	8
3	–12
4	–16
5	–20

   a. $f(x) = -4x$
   b. $f(x) = 4x$
   c. $f(x) = x - 4$
   d. $f(x) = x + 4$

5. **Simplify**
   $(2n^2 + 4n + 4)(4n - 5)$
   a. $8n^3 + 26n^2 - 36n - 20$
   b. $8n^3 + 6n^2 - 4n - 20$
   c. $8n^3 + 4n^2 - 6n - 20$
   d. $8n^3 - 6n^2 + 36n - 20$

6. Crystal earns $5.50 per hour mowing lawns.
   a. Write a rule to describe how the amount of money m earned is a function of the number of hours h spent mowing lawns.
   b. How much does Crystal earn if she works 3 hours and 45 minutes?
   a. $m(t) = 3h + 45$; $61.50
   b. $m(t) = \frac{h}{5.50}$; $0.68
   c. $m(t) = 5.50h$; $18.98
   d. $m(t) = 5.50h$; $20.63

7. **Write an equation in point-slope form for the line through the given point with the given slope.**
   $(4, -6)$, $m = \frac{3}{5}$
   a. $y + 6 = \frac{3}{5}x - 4$
   b. $y - 6 = \frac{3}{5}(x + 4)$
   c. $y + 6 = \frac{3}{5}(x - 4)$
   d. $y - 4 = \frac{3}{5}(x + 6)$

8. A line passes through (2, –1) and (8, 4).
   a. Write an equation for the line in point-slope form.
   b. Rewrite the equation in standard form using integers.
   a. $y + 1 = \frac{5}{6}(x - 2)$; $-5x + 6y = -16$
   b. $y - 1 = \frac{5}{6}(x - 2)$; $-5x + 6y = 16$
   c. $y + 1 = \frac{5}{6}(x + 2)$; $-5x + 6y = -16$
   d. $y - 2 = \frac{5}{6}(x + 1)$; $-5x + 6y = 17$

9. **Write an equation for the line that is parallel to the given line and that passes through the given point.**
   $y = -5x + 3$; $(-6, 3)$
   a. $y = -5x + 27$
   b. $y = -5x - 27$
   c. $y = 5x - 9$
   d. $y = -5x + 9$

10. **Write the equation of a line that is perpendicular to the given line and that passes through the given point.**
    $4x - 12y = 2$, $(10, -1)$
    a. $y = 3x + 29$
    b. $y = -\frac{1}{3}x + 29$
    c. $y = -3x + 29$
    d. $y = -\frac{1}{3}x + 7$

11. What is the solution of the system of equations?
    $y = 3x + 7$
    $y = x - 9$
    a. (–1, –10)
    b. (–17, –8)
    c. (4, 19)
    d. (–8, –17)

Simplify the expression.

12. $(3xy^3)^2(xy)^6$
    a. $9x^8y^{12}$
    b. $3x^8y^{12}$
    c. $2x^3y^{12}$
    d. $9x^8y^9$

13. $\left(\frac{m^{-1}m^5}{m^{-2}}\right)^{-3}$
    a. $-\frac{3m^4}{m^{-2}}$
    b. $\frac{1}{m^{18}}$
    c. m^{18}
    d. $-m^{216}$

14. Suppose a population of 250 crickets doubles in size every 6 months. How many crickets will there be after 2 years?
    a. 4,000 crickets
    b. 6,000 crickets
    c. 2,000 crickets
    d. 1,000 crickets

15. **Simplify the difference.**
    $(4w^2 - 4w - 8) - (2w^2 + 3w - 6)$
    a. $2w^2 - 7w - 2$
    b. $6w^2 - 1w - 14$
    c. $2w^2 - 1w - 14$
    d. $6w^2 + 7w + 2$

16. **Simplify the product.**
    $8x^2(4x^2 + 4)^6$
    a. $12x^4 + 12x^2y^6$
    b. $32x^4 + 32x^2y^6$
    c. $12x^4 + 12x^2y^6$
    d. $32x^4 + 32xy^8$

17. **Factor the polynomial.**
    $2x^3 + 4x^2 + 8x$
    a. $2x(x^2 + 2x + 4)$
    b. $2x(x + 2)(x + 4)$
    c. $x(2x^2 + 4x + 8)$
    d. $2x^3 + 4x^2 + 8x$

18. **Solve the equation. Round to the nearest hundredth if necessary.**
    $x^2 + 3x = 24$
    a. 4.66, 5.12
    b. 3.62, –6.62
    c. 3.55, –6.55
    d. 24.75, –27.75

19. **Solve the equation by factoring.**
    $6x^2 + 17x + 13 = 20x^2 - 32$
    a. $\frac{5}{3}, \frac{9}{2}$
    b. $-\frac{5}{2}, \frac{9}{7}$
    c. $-\frac{5}{2}, -\frac{9}{7}$
    d. $-\frac{5}{3}, \frac{9}{2}$

20. Find the area of the UNSHADED region. Write your answer in standard form.

a. $-2x^2 + 10x + 25$
b. $x^2 + 8x + 25$
c. $10x + 25$
d. $x^2 + 10x + 25$

Factor the expression.

21. $k^2 + kf - 2f^2$
a. $(k - 2f)(k + f)$
b. $(k + 2f)(k - f)$
c. $(k + 2f)(k + f)$
d. $(k - 2f)(k - f)$

22. $12d^2 + 4d - 1$
a. $(6d + 1)(2d + 1)$
b. $(6d - 1)(2d - 1)$
c. $(6d - 1)(2d + 1)$
d. $(6d + 1)(2d - 1)$

23. $k^2 - 16h^2$
a. $(k + 4h)(k + 4h)$
b. $(k - 4h^2)(k + 4)$
c. $h^2(k + 4)(k - 4)$
d. $(k + 4h)(k - 4h)$

24. $x^3 + 216$
a. $(x - 6)(x^2 + 6x + 36)$
b. $(x + 6)(x^2 - 6x + 36)$
c. $(x - 6)(x^2 - 6x + 36)$
d. $(x + 6)(x^2 + 6x + 72)$

25. Find the radius of a circle with an area of $\pi(16x^2 + 24x + 9)$.
a. $3x - 4$
b. $9x - 16$
c. $16x + 9$
d. $4x + 3$

26. Find the equation of the axis of symmetry and the coordinates of the vertex of the graph of the function.
$y = 4x^2 + 5x - 1$
a. $x = \frac{5}{8}$; vertex: $\left(\frac{5}{8}, 4\frac{5}{8}\right)$
b. $x = \frac{5}{8}$; vertex: $\left(\frac{5}{8}, -5\frac{11}{16}\right)$
c. $x = -\frac{5}{8}$; vertex: $\left(-\frac{5}{8}, -5\frac{11}{16}\right)$
d. $x = -\frac{5}{8}$; vertex: $\left(-\frac{5}{8}, -2\frac{9}{16}\right)$

27. The quadratic equation $x^2 + a = 0$, where $a > 0$, _____ has at least one real number solution.
a. always
b. sometimes
c. never

28. **Solve the equation. Round to the nearest hundredth if necessary.**
$7x^2 - 16x = 8$
a. 0.42, –2.71
b. 2.71, –0.42
c. 35.43, –33.14
d. 5.42, –2.95

29. **Solve the equation. Check your solution.**
$(\sqrt{r + 5})^2 = 11^2$
a. 126
b. 6
c. 17
d. 116

30. **Solve the equation. Check your solution.**
$\frac{2}{x^2 - 1} - \frac{1}{x - 1} = 1$
a. $x = 1, -2$
b. $x = -2$
c. $x = -2, 0$
d. $x = 0$

31. **Solve the equation. Identify any extraneous solutions.**
$x = \sqrt{-3x + 40}$
a. 8 is a solution to the original equation. The value –5 is an extraneous solution.
b. 5 and 8 are both extraneous solutions.
c. 5 is a solution to the original equation. The value –8 is an extraneous solution.
d. 5 and –8 are solutions.

32. Describe how the graph of $g(x) = \frac{3}{x - 4} + 5$ is a translation of $g(x) = \frac{3}{x}$.
a. It is a translation of $g(x) = \frac{3}{x}$, 4 units right and 5 units down.
b. It is a translation of $g(x) = \frac{3}{x}$, 4 units right and 5 units up.
c. It is a translation of $g(x) = \frac{3}{x}$, 4 units left and 5 units up.
d. It is a translation of $g(x) = \frac{3}{x}$, 4 units left and 5 units down.

Describe the graph of the function.

33. $y = \sqrt{x - 6} + 2$
a. The graph is the radical function $y = \sqrt{x}$ shifted right 6 units and up 2 units.
b. The graph is the radical function $y = \sqrt{x}$ shifted left 6 units and up 2 units.
c. The graph is the radical function $y = \sqrt{x}$ shifted right 6 units and down 2 units.
d. The graph is the radical function $y = \sqrt{x}$ shifted left 2 units and up 6 units.

34. $y = 4x^2 + 16x - 18$
a. The graph is a parabola with axis of symmetry at $x = 2$.
b. The graph is a parabola with axis of symmetry at $x = 18$.
c. The graph is a parabola with axis of symmetry at $x = 4$.
d. The graph is a parabola with axis of symmetry at $x = -2$.

35. $y = |x - 4| - 7$
a. The graph is an absolute value function with vertex (7, –4).
b. The graph is an absolute value function with vertex (–4, –7).
c. The graph is an absolute value function with vertex (–4, 7).
d. The graph is an absolute value function with vertex (4, –7).

Simplify the rational expression.

36. $\frac{5x + 15}{5x - 15}$
a. $\frac{x + 3}{x - 3}$
b. -1
c. $\frac{x + 15}{x - 15}$
d. $\frac{5x - 3}{5x + 3}$

37. $\frac{x^2 - 2x - 24}{x^2 - 5x - 36}$
a. $\frac{x - 6}{x + 9}$
b. $\frac{x + 6}{x + 9}$
c. $\frac{x + 6}{x - 9}$
d. $\frac{x - 6}{x - 9}$

Multiply.

38. $\frac{x^2 - 16}{6x} \cdot \frac{7x}{x + 4}$

a. $\frac{7(x + 4)}{6}$

b. $\frac{7(x - 4)}{6}$

c. $\frac{(x + 4)^2(x - 4)}{42x^2}$

d. $\frac{(x - 4)^2(x + 4)}{42x^2}$

Divide.

39. $\frac{x^2 + 9x + 20}{x^2 - 25} \div \frac{x + 4}{x - 4}$

a. $\frac{x - 4}{x - 5}$

b. $\frac{x + 5}{x - 5}$

c. $\frac{x + 5}{x - 4}$

d. $\frac{9x + 4}{5}$

40. $(6x^2 - 13x + 2) \div (3x - 2)$

a. $2x - 3$

b. $2x - 7$

c. $2x - 3 - \frac{4}{3x - 2}$

d. $2x - 3 - \frac{6}{3x - 2}$

Add or subtract.

41. $\frac{-x + 6}{-12x} + \frac{-x - 6}{-12x}$

a. $\frac{1}{3}$

b. $\frac{x}{6}$

c. $\frac{-x - x}{-24x}$

d. $\frac{1}{6}$

42. $\frac{-5x}{x - 9} - \frac{-8}{x - 9}$

a. $\frac{-5x + 8}{x - 9}$

b. $\frac{-5x - 8}{x - 9}$

c. $\frac{x - 9}{-5x}$

d. $\frac{x + 8}{x}$

Simplify the expression.

43. $(2 - 5i) - (3 + 4i)$

a. $1 + 9i$

b. $5 - i$

c. $-1 - 9i$

d. $-10i$

44. $(2 + 5i)(-1 + 5i)$

a. $-27 + 5i$

b. $23 + 5i$

c. $-2 + 25i$

d. $-2 + 5i$

Solve the quadratic equation by completing the square.

45. $x^2 + 10x + 14 = 0$

a. -10 ± 6

b. $100 \pm \sqrt{11}$

c. 5 ± 6

d. $-5 \pm \sqrt{11}$

46. $3x^2 + 7x = -9$

a. $\frac{7}{6} \pm \frac{\sqrt{20}}{6}i$

b. $-\frac{7}{3} \pm \frac{\sqrt{101}}{3}i$

c. $-\frac{7}{6} \pm \frac{\sqrt{59}}{6}i$

d. $\frac{7}{3} \pm \frac{\sqrt{59}}{3}i$

47. Write $4x^2(-2x^2 + 5x^3)$ in standard form. Then classify it by degree and number of terms.

a. $2x + 9x^4$; quintic binomial

b. $20x^5 - 8x^4$; quintic binomial

c. $2x^5 - 8x^4$; quintic trinomial

d. $20x^5 - 10x^4$; quartic binomial

48. Write $4x^3 + 8x^2 - 96x$ in factored form.

a. $6x(x + 4)(x - 4)$

b. $4x(x - 4)(x + 6)$

c. $4x(x + 6)(x + 4)$

d. $-4x(x + 6)(x + 4)$

49. Use a graphing calculator to find the relative minimum, relative maximum, and zeros of $y = 3x^3 + 15x^2 - 12x - 60$. If necessary, round to the nearest hundredth.

a. relative minimum: (−62.24, 0.36), relative maximum: (37.79, −3.69), zeros: $x = 5, -2, 2$

b. relative minimum: (0.36, −62.24), relative maximum: (−3.69, 37.79), zeros: $x = -5, -2, 2$

c. relative minimum: (0.36, −62.24), relative maximum: (−3.69, 37.79), zeros: $x = 5, -2$

d. relative minimum: (−62.24, 0.36), relative maximum: (37.79, −3.69), zeros: $x = -5, -2$

50. Write a polynomial function in standard form with zeros at 5, −4, and 1.

a. $f(x) = x^3 - 2x^2 - 19x - 9$

b. $f(x) = x^3 - 2x^2 - 19x + 20$

c. $f(x) = x^3 - 21x^2 + 60x - 9$

d. $f(x) = x^3 + 20x^2 - 2x - 19$

51. Find the zeros of $f(x) = (x + 3)^2(x - 5)^6$ and state the multiplicity.

a. 2, multiplicity −3; 5, multiplicity 6

b. −3, multiplicity 2; 6, multiplicity 5

c. −3, multiplicity 2; 5, multiplicity 6

d. 2, multiplicity −3; 6, multiplicity 5

Find the roots of the polynomial equation.

52. $2x^3 + 2x^2 - 19x + 20 = 0$

a. $\frac{3 + i}{2}, \frac{3 - i}{2}, -4$

b. $\frac{-3 + 2i}{2}, \frac{-3 - 2i}{2}, 4$

c. $\frac{-3 + i}{2}, \frac{-3 - i}{2}, -4$

d. $\frac{3 + 2i}{2}, \frac{3 - 2i}{2}, 4$

53. A polynomial equation with rational coefficients has the roots $5 + \sqrt{1}, 4 - \sqrt{7}$. Find two additional roots.

a. $1 + \sqrt{5}, 7 - \sqrt{4}$

b. $5 - \sqrt{1}, 4 + \sqrt{7}$

c. $5 + \sqrt{1}, 4 - \sqrt{7}$

d. $1 - \sqrt{5}, 7 + \sqrt{4}$

Evaluate the logarithm.

54. $\log_5 \frac{1}{625}$

a. −3

b. 5

c. −4

d. 4

55. $\log 0.01$

a. −10

b. −2

c. 2

d. 10

Write the expression as a single logarithm.

56. $5 \log_b q + 2 \log_b y$

a. $\log_b(q^5y^2)$

b. $(5 + 2) \log_b(q + y)$

c. $\log_b(q^5 + y^2)$

d. $\log_b(qy^{5 \cdot 2})$

$y = K$ horizontal asym

$y = \frac{a}{x-h} + k$ ← vertical asym $x = h$

57. $4 \log x - 6 \log (x + 2)$
   a. $24 \log \frac{x}{x+2}$
   b. $\log x^4(x+2)^6$
   c. $\log x(x+2)^{24}$
   d. none of these

$\log x^4 - \log (x+2)^6$

$\log \frac{x^4}{(x+2)^6}$

58. Solve $125^{9x-2} = 150$.
   a. 1.8847
   b. −0.1069
   c. 0.3375
   d. 1.0378

$9x - 2 = \log_{125} 150$

$9x = \log_{125} 150 + 2$

$x = \frac{\log_{125} 150 + 2}{9}$ calc $\approx .3375$

59. Solve $\log(4x + 10) = 3$.
   a. $-\frac{7}{4}$
   b. $\frac{495}{2}$
   c. 250
   d. 990

$4x + 10 = 10^3$

$4x + 10 = 1000$

$4x = 990$

$x = \frac{990}{4}$

$x = \frac{495}{2}$

60. Solve $\log(x + 9) - \log x = 3$.
   a. 0.0090
   b. 0.3103
   c. 3.2222
   d. 111

$\log_{10} \frac{x+9}{x} = 3$

$\frac{x+9}{x} = 10^3$

$\frac{x+9}{x} = 1000$

$x + 9 = 1000x$

$999x = 9$

$x = \frac{9}{999}$

$x = .009$

61. Solve $\ln 2 + \ln x = 5$.
   a. 50.000
   b. 74.2
   c. 10
   d. 3

Use natural logarithms to solve the equation. Round to the nearest thousandth.

62. $e^x = \frac{3}{4}$
   a. −0.288
   b. −0.275
   c. 0.275
   d. 0.288

$\ln e^x = \ln \frac{3}{4}$

$x = \ln \frac{3}{4}$

$x \approx -.288$

63. Write an equation for the translation of $y = \frac{4}{x}$ that has the asymptotes $x = 7$ and $y = 6$.
   a. $y = \frac{4}{x-6} + 7$
   b. $y = \frac{4}{x+7} + 6$
   c. $y = \frac{4}{x-7} + 6$
   d. $y = \frac{4}{x+6} + 7$

vertical asym ↑ horizontal asym

64. Find the horizontal asymptote of the graph of $y = \frac{6x^2 + 5x + 9}{7x^2 - x + 9}$.
   a. $y = \frac{6}{7}$
   b. $y = 0$
   c. $y = 1$
   d. no horizontal asymptote

Deg. Den = Deg. Num → horizontal

$y = \frac{6}{7}$

Deg. Den < Deg. num $(y = 0)$

Deg Den > Deg num no horizontal maybe slant

65. Let $g(x) = -5x^2$. Find $g(g(-1))$.
   a. −5
   b. 125
   c. 625
   d. −125

$g(-5(-1)^2)$

$g(-5)$

$g(-5(-5)^2$

$g(-5(25))$

-125

66. Let $f(x) = x^2 - 5$ and $g(x) = 3x^2$. Find $g(f(x))$.
   a. $3x^4 - 30x^2 + 75$
   b. $3x^4 - 15$
   c. $3x^4 - 5$
   d. $9x^4 - 5$

$g(x^2 - 5)$

$3(x^2-5)^2$

$3(x^2-5)(x^2-5)$

$3(x^4 - 10x^2 + 25)$

$3x^4 - 30x^2 + 75$

#61)

$e^{\ln 2(x)} = e^5$

$\frac{2x}{2} = \frac{e^5}{2}$

$x = 74.2$