Algebra Solutions:

1. $\dfrac{11}{14} - \dfrac{12}{7} =$

   $\boxed{\text{A}}$ $\dfrac{-1}{14}$ $\boxed{\text{B}}$ $\dfrac{5}{14}$ $\boxed{\text{C}}$ $\dfrac{-1}{7}$ $\boxed{\boxed{\text{D}}}$ $\dfrac{-13}{14}$

2. $\sqrt{1764}$ is

   $\boxed{\boxed{\text{A}}}$ an integer

   $\boxed{\text{B}}$ a number with finitely many decimal places

   $\boxed{\text{C}}$ an infinite non-repeating decimal

   $\boxed{\text{D}}$ an infinite repeating decimal

3. $6\left(\dfrac{3-2(-1)^2}{\frac{14}{3}-(-5)}\right)^{-1} =$

   $\boxed{\boxed{\text{A}}}$ $\dfrac{18}{29}$ $\boxed{\text{B}}$ 58 $\boxed{\text{C}}$ 2 $\boxed{\text{D}}$ 18

4. $\dfrac{9x^2y}{3x^7y^{-3}+9x^2y} =$

   $\boxed{\text{A}}$ $\dfrac{3y^4}{x^5}+1$ $\boxed{\boxed{\text{B}}}$ $\dfrac{3y^4}{x^5+3y^4}$ $\boxed{\text{C}}$ $\dfrac{3}{x^5y^{-4}+1}$ $\boxed{\text{D}}$ $\dfrac{3}{x^9y^{-4}+3}$

   Divide all of the terms on top and bottom by $3x^2$ and then multiply by y^3.

5. not graded

6. If $y = 2x + 5$ and also $y = 2 - x$, then $(x, y) =$

A $(1,7)$ B $(3,-1)$ $\boxed{\text{C}}$ $(-1,3)$ D $(7,1)$

7. When $x = -8$, $\left(x\right)^{\frac{-2}{3}} - \left(x\right)^{\frac{1}{3}} + \left(x\right)^{0} =$

A 7 B 3 $\boxed{\text{C}}$ $\frac{13}{4}$ D Does not exist

When $x = -8$, $(-8)^{\frac{-2}{3}} = \dfrac{1}{\left((-8)^{\frac{1}{3}}\right)^2}$ *and* $(-8)^{\frac{1}{3}} = -2.$

8. The region described by both $y \le 3x + 5$ and $y \ge 2 - x$ contains the point:

A $(1,9)$ B $(0,0)$ $\boxed{\text{C}}$ $(3,-1)$ $\boxed{\text{D}}$ $(4,1)$

Both solutions are correct.

9. $1 \le |x| \le 2$ describes the same x-values as

A $[1,2]$ B $[-2,2]\cup[-1,1]$ $\boxed{\text{C}}$ $[-2,-1]\cup[1,2]$ D $(-\infty,-2]\cup[-1,1]\cup[2,\infty)$

$|x| \le 2$ *implies* $-2 \le x \le 2$ *and* $|x| \ge 1$ *implies that* $x \le -1$ *and* $x \ge 1$.

10. not graded

Function Solutions:

11. $2c^2(3abc - 4ab) + 7abc - abc^2 - 5abc^3 =$

$\boxed{\text{A}}$ $6abc^3 - 2abc^2$ $\boxed{\text{B}}$ $abc^3 - 5abc^2 + 7abc$ $\boxed{\text{C}}$ $abc^3 - 6abc^2 + 7abc$ $\boxed{\boxed{\text{D}}}$ $abc^3 - 9abc^2 + 7abc$

12. If $f(x) = \dfrac{|x-2|^{\frac{1}{2}}}{x-4}$ =, then $f(-2) =$

$\boxed{\text{A}}$ $\dfrac{1}{3}$ $\boxed{\boxed{\text{B}}}$ $\dfrac{-1}{3}$ $\boxed{\text{C}}$ 0 $\boxed{\text{D}}$ $\dfrac{1}{6}$

13. The function $f(x) = 4x^2 + 4x + 1$ has

$\boxed{\boxed{\text{A}}}$ exactly 1 distinct root

$\boxed{\text{B}}$ exactly 2 distinct roots

$\boxed{\text{C}}$ exactly 3 distinct roots

$\boxed{\text{D}}$ no roots

Using the formula for the roots of a quadratic equation ("quadratic formula"), we get: $x = \frac{-4 \pm \sqrt{16-16}}{2} = -2$.

14. The factored form of $x^3 + 2x^2 - x - 2$ includes the following factor:

$\boxed{\text{A}}$ $(x-2)$ $\boxed{\boxed{\text{B}}}$ $(x+2)$ $\boxed{\text{C}}$ $(2x-1)$ $\boxed{\text{D}}$ $(x-1)^2$

$(-2)^3 + 2(-2)^2 - (-2) - 2 = -8 + 8 + 2 - 2 = 0$ *Therefore,* $(x+2)$ *is a factor.*

15. The domain of $f(x) = \sqrt{3-x}$ is equal to the range of:

$\boxed{\text{A}}$ $g(x) = -2(x+1)^2 - 3$.

$\boxed{\boxed{\text{B}}}$ $g(x) = -5(x+1)^2 + 3$.

$\boxed{\text{C}}$ $g(x) = (x+1)^2 - 3$.

$\boxed{\text{D}}$ $g(x) = 2(x+1)^2 + 3$.

which is equal to $(-\infty, 3]$.

16. Let $f(x) = \dfrac{-2x+1}{x+3}$. Then $f^{-1}(x) =$

$\boxed{\text{A}}$ $\dfrac{x-2}{3x+1}$ $\boxed{\text{B}}$ $\dfrac{x-3}{x+2}$ $\boxed{\text{C}}$ $\dfrac{3x-1}{x+2}$ $\boxed{\boxed{\text{D}}}$ $\dfrac{1-3x}{x+2}$

We set $x = \dfrac{-2y+1}{y+3}$ *and solve for* y.

17. If $\dfrac{a}{b} - 6 = 5b$, then

$\boxed{\boxed{\text{A}}}$ a is a function of b, but b is not a function of a.

$\boxed{\text{B}}$ b is a function of a, but a is not a function of b.

$\boxed{\text{C}}$ a is a function of b, AND b is a function of a.

$\boxed{\text{D}}$ Neither variable is a function of the other.

Multiplying both sides by b *we get:* $a - 6b = 5b^2$ *which is equivalent to* $a = 5b^2 + 6b$. *This is a parabola that passes the vertical line test when b is the variable, but not when a is.*

18. If $f(x) = x^2 + 2x - 1$ and $g(x) = \dfrac{x}{\sqrt{x}}$, then $f(g(4)) =$

$\boxed{\text{A}}$ 23 $\boxed{\boxed{\text{B}}}$ 7 $\boxed{\text{C}}$ $\sqrt{23}$ $\boxed{\text{D}}$ $2\sqrt{2}+3$

$f(g(4)) = f(2) = 7$

19. not graded

20. If $(1, 4)$ is on the graph of $y = f(x)$ then the graph of $y = f^{-1}(f(f^{-1}(x)))$ necessarily includes the point:

$\boxed{\text{A}}$ $(1, 4)$ $\boxed{\text{B}}$ $(-1, -4)$ $\boxed{\text{C}}$ $(-4, -1)$ $\boxed{\boxed{\text{D}}}$ $(4, 1)$

If $(1, 4)$ *is on the graph of* $y = f(x)$, *then* $(4, 1)$ *is on the graph of* $y = f^{-1}(x)$.

So $f^{-1}(f(f^{-1}(4))) = f^{-1}(f(1)) = f^{-1}(4) = 1$

Graphing Solutions:

21. The points $(-3, 1)$ and $(1, 9)$ are on the same line as

$\boxed{\boxed{\text{A}}}$ $(0, 7)$ $\boxed{\text{B}}$ $(0, 2)$ $\boxed{\text{C}}$ $(-1, 4)$ $\boxed{\text{D}}$ $(-1, 3)$

That line is given by the equation $y = 2x + 7$.

22. The set of points that are 4 units away from $(1, -2)$ form the graph of:

$\boxed{\boxed{\text{A}}}$ $(x - 1)^2 + (y + 2)^2 = 16$

$\boxed{\text{B}}$ $(x - 1)^2 + (y + 2)^2 = 4$

$\boxed{\text{C}}$ $(x + 1)^2 + (y - 2)^2 = 2$

$\boxed{\text{D}}$ $(x + 1)^2 + (y - 2)^2 = 4$

23. The vertex of the graph of $y = -2x^2 + 12x + 1$ is:

$\boxed{\text{A}}$ $(-3, 19)$ $\boxed{\text{B}}$ $(36, 8)$ $\boxed{\text{C}}$ $(36, 19)$ $\boxed{\boxed{\text{D}}}$ $(3, 19)$

$y = -2x^2 + 12x + 1 = -2(x^2 - 6x) + 1 = -2(x^2 - 6x + 9 - 9) + 1$

$= -2(x^2 - 6x + 9) + 18 + 1 = -2(x - 3)^2 + 19$ *which has vertex* $(3, 19)$.

24. A parabola with vertex $(1, -4)$ has an axis of symmetry given by the equation:

$\boxed{\text{A}}$ $x = -4$ $\boxed{\text{B}}$ $y = -4$ $\boxed{\text{C}}$ $y = 1$ $\boxed{\boxed{\text{D}}}$ $x = 1$

25. To transform the graph of $y = \sqrt{x}$ into the graph of $y = 3\sqrt{x - 2}$, we can

$\boxed{\text{A}}$ stretch the graph by a factor fo 3 in the x-direction and shift 2 units to the left.

$\boxed{\text{B}}$ stretch the graph by a factor fo 3 in the y-direction and shift 2 units to the left.

$\boxed{\text{C}}$ stretch the graph by a factor fo 3 in the x-direction and shift 2 units to the right.

$\boxed{\boxed{\text{D}}}$ stretch the graph by a factor fo 3 in the y-direction and shift 2 units to the right.

26. The graph of $y = 2x - 1$ intersects the graph of $x^2 + y^2 = 9$ at

A exactly one point.

$\boxed{\text{B}}$ two distinct points.

C no points but they pass within one unit of each other.

D no points and they stay farther than one unit away from each other.

The line includes the point $(0, -1)$ *which is strictly inside the circle. Therefore the graphs have to intersect when the line enters the circle and again when it exits.*

27. The graph of $y = \dfrac{1}{x + \pi}$

A intersects both the x-axis and y-axis.

B intersects neither of the x-axis and y-axis.

C intersects the x-axis, but not the y-axis.

$\boxed{\text{D}}$ intersects the y-axis, but not the x-axis.

$y \neq 0$.

28. If the point $(3, 4)$ is on the graph of $y = f(x)$, then the point $(-3, -4)$ is necessarily on the graph of

A $y = f(-x)$ $\boxed{\text{B}}$ $y = -f(-x)$ C $y = -f(x)$ D $y = f(x)$

29. not graded

30. The graph of $3(x - 5)^2 + (y + 3)^2 = 6$ is

A a circle $\boxed{\text{B}}$ an ellipse C a parabola D an hyperbola

$$\frac{(x-5)^2}{2} + \frac{(y+3)^2}{6} = 1$$

Trigonometry Solutions:

31. $\cos\left(\frac{\pi}{3}\right)$

$\boxed{\text{A}}$ $\frac{1}{\sqrt{3}}$ $\boxed{\text{B}}$ $\frac{\sqrt{3}}{2}$ $\boxed{\text{C}}$ $\frac{1}{\sqrt{2}}$ $\boxed{\boxed{\text{D}}}$ $\frac{1}{2}$

32. $\tan\left(\frac{n\pi}{3}\right) \geq 0$ when $n =$

$\boxed{\text{A}}$ 1, 3, 5 $\boxed{\text{B}}$ 2, 4, 6 $\boxed{\text{C}}$ 1, -1, 0 $\boxed{\boxed{\text{D}}}$ 1, 4, 7

33. $\sin\left(\frac{17\pi}{4}\right) =$

$\boxed{\boxed{\text{A}}}$ $\sin\left(\frac{\pi}{4}\right)$ $\boxed{\text{B}}$ $\sin\left(\frac{5\pi}{4}\right)$ $\boxed{\text{C}}$ $\sin\left(\frac{7\pi}{4}\right)$ $\boxed{\text{D}}$ $\sin\left(\frac{13\pi}{4}\right)$

34. $\sin(-\theta) - \cos(-\theta) =$

$\boxed{\boxed{\text{A}}}$ $-\sin(\theta) - \cos(\theta)$ $\boxed{\text{B}}$ $\sin(\theta) - \cos(\theta)$ $\boxed{\text{C}}$ $\cos(\theta) - \sin(\theta)$ $\boxed{\text{D}}$ $\sin(\theta) + \cos(\theta)$

35. The radian measure of 15° is

$\boxed{\text{A}}$ $\frac{\pi}{3}$ $\boxed{\text{B}}$ $\frac{\pi}{4}$ $\boxed{\boxed{\text{C}}}$ $\frac{\pi}{12}$ $\boxed{\text{D}}$ $\frac{\pi}{24}$

$15 \times \frac{\pi}{180} = \frac{\pi}{12}$.

36. not graded

37. Let $f(x) = 3\cos(2x-4)+5$. The y-values of the graph of $y = f(x)$ are all between

$\boxed{\text{A}}$ -3 and 3 $\boxed{\boxed{\text{B}}}$ 2 and 8 $\boxed{\text{C}}$ -7 and -1 $\boxed{\text{D}}$ 3 and 5

The interval from -3 to 3 gets shifted upwards by 5 to get the interval from 2 to 8.

38. not graded

39. Let triangle ABC have a side of length $a = 6$ that is positioned across from angle $A = 30°$. Let b be the side facing angle B. Then the value of the expression $\dfrac{\sin B}{b}$ is

$\boxed{\text{A}}$ $\dfrac{1}{5}$ $\boxed{\text{B}}$ 3 $\boxed{\boxed{\text{C}}}$ $\dfrac{1}{12}$ $\boxed{\text{D}}$ indeterminate. We do not have enough information.

This ratio is equal to $\dfrac{\sin A}{a}$ *by the Sine Law.*

40. A building has a 25m shadow. A line between the top of the building and the end of the shadow makes an angle of $\frac{\pi}{3}$ with the ground.
From this we can conclude that the height of the building is

$\boxed{\text{A}}$ 25 $\boxed{\boxed{\text{B}}}$ $25\sqrt{3}$ $\boxed{\text{C}}$ 50 $\boxed{\text{D}}$ $\dfrac{25}{3}$

$\tan\frac{\pi}{3} = \sqrt{3}$ *This is also equal to $\frac{x}{25}$, where x is the height of the building.*

Exponential and Logarithm Solutions:

41. $5\ln(e^2) =$.

$\boxed{\text{A}}$ 0 $\boxed{\text{B}}$ $5\ln(2e)$ $\boxed{\text{C}}$ 7 $\boxed{\boxed{\text{D}}}$ 10

$5\ln(e^2) = 5(\ln e)^2 = 10\ln e = 10(1) = 10.$

42. If $A > 0$ and $B > 0$ then $\ln(A + B) =$

$\boxed{\text{A}}$ $(\ln A)(\ln B)$

$\boxed{\text{B}}$ $\ln A + \ln B$

$\boxed{\text{C}}$ $\dfrac{\ln A}{\ln B}$

$\boxed{\boxed{\text{D}}}$ no other expression. This expression does not simplify.

43. If $2^w = 7$, then

$\boxed{\text{A}}$ $\log_2 w = 7$ $\boxed{\boxed{\text{B}}}$ $\log_2 7 = w$ $\boxed{\text{C}}$ $\log_7 w = 2$ $\boxed{\text{D}}$ $\log_7 2 = w$

44. $\log_5\left(\dfrac{1}{125}\right) =$

$\boxed{\text{A}}$ $\dfrac{1}{3}$ $\boxed{\text{B}}$ $\sqrt{3}$ $\boxed{\boxed{\text{C}}}$ -3 $\boxed{\text{D}}$ 0.3

45. The domain of the function $f(x) = \ln|x|$ is

$\boxed{\text{A}}$ $(-\infty, \infty)$ $\boxed{\text{B}}$ $(0, \infty)$ $\boxed{\text{C}}$ $(-\infty, 0)$ $\boxed{\boxed{\text{D}}}$ $(-\infty, 0) \cup (0, \infty)$

46. The equation $\ln|x^2+4x-21| - \ln|x+7| = 1$ has

$\boxed{\boxed{\text{A}}}$ 1 solution $\boxed{\text{B}}$ 2 solutions $\boxed{\text{C}}$ 3 solutions $\boxed{\text{D}}$ no solution

$\ln\left|\dfrac{x^2+4-21}{x+7}\right| = 1$ *which implies that* $\ln\left|\dfrac{(x+7)(x-3)}{(x+7)}\right| = 1.$

If $\ln(x-3) = 1$, *then* $e^{\ln(x-3)} = e^1$. *So* $x-3=e$ *and* $x=e+3$ *which turns* $x^2+4x-21$ *and* $x+7$ *into positive expression. Therefore, the original equation is well defined and true.*

47. The graphs of the function $f(x) = e^x$ and $g(x) = \ln x$

$\boxed{\text{A}}$ intersect only once.

$\boxed{\text{B}}$ intersect once on either side of the y-axis.

$\boxed{\text{C}}$ intersect once on either side of the x-axis.

$\boxed{\boxed{\text{D}}}$ do not intersect.

48. The solutions to $e^{-x}(x^2+3x-40) \le 0$ are contained inside the interval

$\boxed{\text{A}}$ $(-\infty,-8]\cup[5,\infty)$ $\boxed{\boxed{\text{B}}}$ $[-8,5]$ $\boxed{\text{C}}$ $(-\infty,-5]\cup[8,\infty)$ $\boxed{\text{D}}$ $[-5,8]$

e^{-x} *is always positive.* $x^2+3x-40 = (x+8)(x-5)$. *This is less than or equal to zero between the roots* $x=-8$ *and* $x=5$.

49. If $2^{3x+1} = 8^{2x-1}$ then $x =$

$\boxed{\text{A}}$ -2 $\boxed{\boxed{\text{B}}}$ $\dfrac{4}{3}$ $\boxed{\text{C}}$ 5 $\boxed{\text{D}}$ There is no solution to this equation.

$2^{3x+1} = (2^3)^{2x-1}$ *which is equivalent to* $2^{3x+1} = 2^{6x-3}$.

50. The following expression is equal to 2:

$\boxed{\text{A}}$ $-\log_2 -4$ $\boxed{\text{B}}$ $\left(e^{\ln 1}\right)^2$ $\boxed{\text{C}}$ $\log_2\sqrt{2}$ $\boxed{\boxed{\text{D}}}$ $e^{-\ln\frac{1}{2}}$

$e^{-\ln\frac{1}{2}} = e^{\ln\frac{1}{2}^{-1}} = e^{\ln 2} = 2$