1. C The range of the relation $\{(-1, 2), (0,0), (1,2)\}$ is $\{0,2\}$

2. B Given $g(x) = \frac{1}{3-|x|}$, then $3-|x| \neq 0$
therefore, $|x| \neq 3$, $x \neq 3$, $x \neq -3$

3. D Graphing the system of inequalities, the vertex points of the graph are (2,2), (-.5, 2), (-2.5, -2), and (0, -2)

4. B When simplified
$$\frac{x+y}{x^{-1}+y^{-1}} = \frac{x+y}{\frac{1}{x}+\frac{1}{y}} = \frac{x+y}{\frac{x+y}{xy}} = xy$$

5. D Factoring $2x^3 - 7x^2 + 2x + 3$, the factors are $(x-3)(2x+1)(x-1)$

6. C Factoring $x^4 - 8x^2 + 16 = 0$ $(x+2)^2 (x-2)^2 = 0$,
therefore –2 has multiplicity of 2.

7. D Given $f(t) = \frac{1+t}{t}$ then
$$\frac{1}{t}f\left(\frac{1}{t}\right) = \left(\frac{1}{t}\right)\left(\frac{1+\frac{1}{t}}{\frac{1}{t}}\right) = \left(\frac{1}{t}\right)(t+1) = \frac{t+1}{t} = f(t)$$

8. A $\log_b 250 = \log_b 25 + \log_b 10 = 2\log_b 5 + \log_b 10 =$
$2\log_b \frac{10}{2} + \log_b 10 = 2(\log_b 10 - \log_b 2) + \log_b 10 =$
$3\log_b 10 - 2\log_b 2 = 3y - 2x$

9. C Using Descartes Rule of Signs,
$f(x) = 2x^5 - x^3 - x - 1$ has at most 2 negative zeros. There are 2 sign changes when $f(-x)$ is evaluated.
$f(-x) = 2(-x)^5 - (-x)^3 - (-x) - 1 = -2x^5 + x^3 + x - 1$

10. E $N = \begin{vmatrix} 4 & 3 \\ -2 & 2 \end{vmatrix} = 14$

11. D Given matrices $P = \begin{bmatrix} 4 & -6 \\ 1 & 3 \end{bmatrix}$ and
$Q = \begin{bmatrix} -1 & 7 \\ 2 & -2 \end{bmatrix}$ then $2P + 3Q = \begin{bmatrix} 5 & 9 \\ 8 & 0 \end{bmatrix}$

12. A If P is a 2 by 2 matrix, which of the following is $P^{-1} \cdot P$ = identity matrix.

13. D Solving for the nth term, $a_n = 2 + (n-1)4$, $a_n = 4n-2$. Solving for the number of terms
$1250 = \frac{n}{2}(2 + 4n - 2)$ $2500 = 4n^2$ $n=25$

14. C Solving for the common ratio $\frac{-9}{4} = \frac{1}{12}r^3$
$r^3 = -27$, $r = -3$

15. B Find the distance between a point on one of the lines and the other line using $\frac{|Ax+By+C|}{\sqrt{A^2+B^2}}$
$$\frac{|2(0)-1(4)+1|}{\sqrt{2^2+(-1)^2}} = \frac{3\sqrt{5}}{5}$$

16. D $\sum_{b=1}^{\infty} 4b = 4 + 8 + 12 + \ldots$

17. C $g(f(x)) = 2(3x-4)^3 + 1 = 54x^3 - 216x^2 + 288x - 127$

18. B Given $f(x) = \frac{x+2}{x+1}$, then the inverse is found as follows:
$x = \frac{y+2}{y+1}$; $xy + x = y + 2$; $y = \frac{x-2}{1-x}$; $f^{-1}(x) = \frac{x-2}{1-x}$

19. B If you let a = 1 you easily see that you have an equilateral triangle.

20. C Given the parabola $(x-6)^2 = 8(y+1)$ the vertex i s (6,-1) and p = 2 therefore the focus is (6,1).

21. A Rewriting the equation of the ellipse
$4x^2 + 9y^2 + 16x + 18y - 11 = 0$
$4(x^2 + 4x + 4) + 9(y^2 + 2y + 1) = 36$
$\frac{(x+2)^2}{9} + \frac{(y+1)^2}{4} = 36$ then a = 3, b = 2, and $c = \sqrt{5}$.
The sum = $2(3) + 2(2) + 2(\sqrt{5}) = 10 + 2(\sqrt{5})$

22. C For an ellipse, $a^2 - b^2 = c^2$ and eccentricity is $e = \frac{c}{a}$ Since the minor axis has length $2\sqrt{21}$, the value of b = $\sqrt{21}$. From the focus the value of c = 2. Then
$a^2 - \left(2\sqrt{21}\right)^2 = 2^2$ $a^2 = 25$, $a = 5$
This makes the eccentricity $e = \frac{2}{5}$

23. B For the equation $\frac{x^2}{3} - \frac{y^2}{3} = 1$, $a^2 = 3$ and $b^2 = 3$ then solving for $a^2 + b^2 = c^2$ $c = \sqrt{6}$
The focus points are $(\sqrt{6}, 0)$ and $(-\sqrt{6}, 0)$

24. B First fix a person and then everyone else is relative to them. $5! = 120$

25. A The number of possible arrangements of the letters in the word *banana* is $\frac{6!}{3!\ 2!} = 60$

26. A If the probability of an event is $\frac{a}{b}$, then the odds of the event occurring a: b-a

27. D The largest possible median will occur when the three numbers not given are larger than those given. Let a, b, and c denote the three missing numbers, where $9 \le a \le b \le c$. Listed from smallest to largest, the list is 3, 5, 5, 7, 8, 9, a, b, c so the median is 8

28. A Solving $H = \frac{A}{1 + Be^{-rt}}$ for t you get

$$\begin{aligned} H + HBe^{-rt} &= A \\ HBe^{-rt} &= A - H \\ \ln e^{-rt} &= \ln\left(\frac{A-H}{HB}\right) \\ -rt &= \ln(A-H) - \ln H - \ln B \\ t &= \left(\frac{1}{r}\right)\left(\ln H + \ln B - \ln(A-H)\right) \end{aligned}$$

29. C let L = length and W = width; LW = 6;

$2W + 2L = 6\sqrt{3}$; $W = \frac{6}{L}$; $\frac{6}{L} + L = 3\sqrt{3}$;

$L^2 - 3\sqrt{3}L + 6 = 0$ $L = \sqrt{3}$ or $L = 2\sqrt{3}$.

Shorter side therefore is $\sqrt{3}$.

30. A For $f(x) = x^3 + a_1x^2 + a_2x + a_3$, the maximum number of zeros would be 3. Since the equation is an odd degree, the must be at least 1 zero. Therefore $1 \le n \le 3$.

31. D If you graph each of the given functions, they all pass the horizontal line test. Therefore each relation has an inverse that is also a function.

32. D let x = amount of solution C, let 2x = amount of solution B, and let y = amount of solution A Solving the system
$3x + y = 50$; $1.1x + .1y = 17$ $x = 15, y = 5$

33. C Average speed = $\frac{\text{total distance}}{\text{total time}}$

Ave. Speed = $\frac{2}{\frac{1}{x} + \frac{1}{y}} = \frac{2}{\frac{x+y}{xy}} = \frac{2xy}{x+y}$ mph

34. B The sum of the coefficients is $(2+1-1)^8 = 256$

35. E Since $0^z = 0$ for any $z > 0$, $f(0) = f(-2) = 0$

$f(0)+f(-1)+f(-2)+f(-3)=(-1)^0(1)^2+(-3)^{-2}(-1)^0=1+\frac{1}{9}=\frac{10}{9}$

36. D $r \# s = \frac{r+s}{rs}$ is commutative because

$\frac{r+s}{rs} = \frac{s+r}{sr}$

37. A $144_b = 1 \cdot b^2 + 4b + 4 = (b+2)^2$
The number is a perfect square for any integral value of b. However, since the digits up to 4 are used to write the number, $b > 4$.

38. C Let the original radius be 1. The original volume = $\frac{4}{3}\pi(1)^3 = \frac{4}{3}\pi$. The new radius is 2.

The new volume is $\frac{4}{3}\pi(2)^3 = \frac{4}{3}\pi(8)$

The increase in volume is $\frac{4}{3}\pi(7)$. The

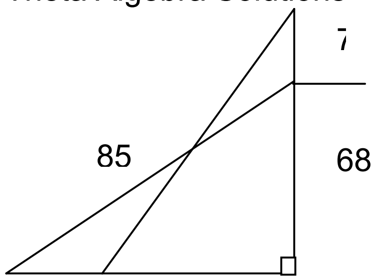
percent increase = $\frac{\frac{4}{3}\pi(7)}{\frac{4}{3}\pi} \cdot 100 = 700$

39. B $\log x \ge \log 2 + \log x^{\frac{1}{2}} \rightarrow \log x - \log x^{\frac{1}{2}} \ge \log 2$

$\log \frac{x}{x^{\frac{1}{2}}} \ge \log 2 \rightarrow \log x^{\frac{1}{2}} \ge \log 2$

$x^{\frac{1}{2}} \ge 2 \rightarrow x \ge 4$

40. C By the Pythagorean theorem , $85^2 = 75^2 + y^2$
$y = 40$ and $85^2 = 68^2 + (x+y)^2$
$2601=(x+40)^2$ $x + 40 = 51$ $x = 11$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