Alpha Logs and Exponents
2008 National Convention

1. C
2. A
3. B
4. B
5. C
6. A
7. C
8. D
9. B
10. A
11. A
12. C
13. B
14. E (1)
15. B
16. D
17. A
18. C
19. A
20. C
21. B
22. E (-448)
23. E (undefined)
24. C
25. A
26. B
27. B
28. D
29. B
30. C

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1. $\log\frac{4x^{\frac{1}{2}}}{y^2} = \log\frac{4\sqrt{x}}{y^2}$ C

2. $e^x = 5e^x - 5$
$-4e^x = -5$ A
$e^x = \frac{5}{4}$
$x = \ln\frac{5}{4}$

3. $90 = 75 + 5e^{\ln\frac{3}{8}t}$
$3 = e^{\ln\frac{3}{8}t}$ B
$t = 8$

4. $1.5P = Pe^{.1t}$
$1.5 = e^{.1t}$ B
$\frac{\ln 1.5}{0.1} = t$

5. $9^3 = 3^2 9^2$ C
$2 + 3 = 5$

6. $\frac{1}{3}[\log_b 4 + 5\log_b x + 7\log_b y]$ A

7. $characteristic = 2$
$mantissa = 0.6385$ C

8. $20 = 5e^{4r}$
$4 = e^{4r}$
$r = \frac{\ln 4}{4}$ B
$P = 5e^{24(\frac{\ln 4}{4})} = 5(4096) = 20,480$

9. $y = 2e^{-0.21t}$ B

10. $f(x) = -\log_3(x+2) - 4$
$x + 2 = 0$ A
$x = -2$

11. $a. 2000e^5$
$b. 2000(1+\frac{.05}{4})^{40} = 2000(1.0125^{40})$ A
$c. 2000(1+\frac{.1}{2})^{20} = 2000(1.05^{20})$
$d. 2000(1+\frac{.1}{12})^{120} = 2000(1.008)^{120}$

12. Degree of Denominator = Degree of Numerator, use the ratio of the coefficients: C
$\frac{300,000}{1,000} = \$300$

13. $\left(\frac{-4!uv^{-20}v^{u}}{8!\frac{u^{-8}v^{-8}u^{-80}}{v^{2008}}}\right)^{2}=\left(\frac{-uv^{-20+u}}{1680u^{-88}v^{-2016}}\right)^{2}=\left(\frac{-u^{89}v^{1996+u}}{1680}\right)^{2}=\frac{u^{178}v^{3992+2u}}{1680^{2}}$ B

14. $Arc\cos(1)=0$

$\left(\frac{(n-1)^{-2}}{(n^{2}-1)^{-3}}\right)^{0}=1$ E (NOTA)

15. $\frac{\left(\log 3^{5}\right)\left(\log 5^{4}\right)\left(\log 6^{3}\right)}{\left(\log 6^{2}\right)\left(\log 3^{6}\right)\left(\log 5^{2}\right)}=\frac{(5\log 3)(4\log 5)(3\log 6)}{(2\log 6)(6\log 3)(2\log 5)}=\frac{60}{24}=\frac{5}{2}$ B

16. $3^{-x}(9^{2x^{2}}(27^{-7x}(243^{-\frac{2}{5}})))$

$3^{-x}(9^{2x^{2}}(\left(3^{3}\right)^{-7x}\left(3^{-2}\right)))$

$3^{-x}(9^{2x^{2}}(\left(3^{-21x}\right)\left(3^{-2}\right)))$ D

$3^{-x}(\left(3^{2}\right)^{2x^{2}}(\left(3^{-21x-2}\right)))$

$3^{-x}(\left(3^{4x^{2}}\right)(\left(3^{-21x-2}\right)))=3^{4x^{2}-22x-2}$

17. $2^{8}\approx 250, 3^{5}\approx 250$

$2^{2008}\geq 250^{251}, 3^{1004}\approx 250^{201}$

$\frac{1}{8}^{-502}=2^{-3(-502)}=2^{1506}$ A

$\frac{1}{9}^{-251}=3^{-2(-251)}=3^{502}$

18. $2\cos^{2}x-\cos x-1=0$

$(2\cos x+1)(\cos x-1)=0$

$\cos x=\frac{-1}{2},1$

$0<x\leq\pi$ C

$\cos x\neq 1$

$(\frac{5\pi}{6},\frac{-1}{2})$

19. $\left(2^{6}\right)^{-x}=2^{10}$

$-6x=10$ A

$x=\frac{-5}{3}$

20. $4x^{2}+43x-62=2$

$4x^{2}+43x-64=0$ C

$\frac{c}{a}=\frac{-64}{4}=-16$

$(1-i)$

$Radius = \sqrt{2}, Angle = \frac{-\pi}{4}$

21. B

$(\sqrt{2})^{24} cis 24(\frac{-\pi}{4}) = 2^{12} cis(-6\pi)$

$2^{12}(\cos(-6\pi) + i\sin(-6\pi)) = 2^{12}(1+0i) = 2^{12}$

$C(8,3)(2x)^3(-y)^5$

22. E = -448

$-448x^3y^5$

$\frac{\sin^2 x \sec^2 x}{1+\tan^2 x} = \frac{\sin^2 x \sec^2 x}{\sec^2 x}, \sin^2 x = 1$

$\sin x = \pm 1$

23. Both values make equation undefined. E

$x = \pm\frac{\pi}{2}$

undefined

$e^{i\theta} = cis\theta$

24. C

$cis\frac{\pi}{4} = \frac{\sqrt{2}}{2} + \frac{\sqrt{2}i}{2}$

$(-\frac{i}{2})^{2008} = \left(\frac{-1}{2}\right)^{2008} i^{2008}$

25. A

$\frac{1}{2^{2008}}(1) = \frac{1}{2^{2008}}$

$6^x(6^{2x}) = 54$

$6^{3x} = 54$

26. B

$3x\log 6 = \log 54$

$x = \frac{\log 54}{3\log 6}$

$\left(x^{\frac{2}{3}} - 27\right)\left(x^{\frac{2}{3}} - 64\right) = 0$

27. B

$x^{\frac{2}{3}} = 27, 64$

$x = 27^{\frac{3}{2}}, 64^{\frac{3}{2}}$

$\sum x = 27^{\frac{3}{2}} + 64^{\frac{3}{2}}$

$8x^2(2x-1) + 15(2x-1) grouping$

$(8x^2+15)(2x-1) > 0$

28. D

$8x^2 + 15 \neq 0, 2x - 1 = 0, x = \frac{1}{2}$

$x > \frac{1}{2}$

29. B

$$x\begin{pmatrix} 0 & \frac{1}{5} \\ 25 & -1 \end{pmatrix} - 5\begin{pmatrix} 81 & \frac{1}{5} \\ e^5 & -1 \end{pmatrix} + \begin{pmatrix} 81 & 0 \\ e^5 & 25 \end{pmatrix} = 0$$

$$-5x - 5\left[-81 - e^5\right] + 2025 = 0$$

$$-5x + 405 + 5e^5 + 2025 = 0$$

$$-5x + 5e^5 = -2430$$

$$x = 486 + \frac{e^5}{5}$$

30. C

$$\left[\frac{(x^2-y^2)^{-3}}{-(x+y)^{-4}}\right]^{\frac{-2}{3}} = \left[\frac{-(x+y)^4}{(x^2-y^2)^3}\right]^{\frac{-2}{3}} = \left[\frac{-(x+y)(x+y)(x+y)(x+y)}{(x-y)(x+y)(x-y)(x+y)(x-y)(x+y)}\right]^{\frac{-2}{3}}$$

$$\left[\frac{-(x+y)}{(x-y)(x-y)(x-y)}\right]^{\frac{-2}{3}} = \left[\frac{(x-y)^3}{-(x+y)}\right]^{\frac{2}{3}} = \frac{(x-y)^2}{(x+y)^{\frac{2}{3}}}$$