1) $2\log a + 2\log b + 2\log c = 22$

$\log a + \log b + \log c = 11$

$\log(abc) = 11$

$abc = 10^{11}$

$x = 11$

B

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2)

I $x^{x^{x^{\cdots}}} = \frac{1}{2} \Rightarrow x^{\frac{1}{2}} = \frac{1}{2} \Rightarrow x = \frac{1}{4}$

II $x^{x^{x^{\cdots}}} = 1 \Rightarrow x^1 = 1 \Rightarrow x = 1$

III $x^{x^{x^{\cdots}}} = 2 \Rightarrow x^2 = 2 \Rightarrow x = \sqrt{2}$

IV $x^{x^{x^{\cdots}}} = 4 \Rightarrow x^4 = 4 \Rightarrow x = \sqrt{2}$

(extraneous because $x^{x^{x^{\cdots}}} = 2$ when $x = \sqrt{2}$)

B

so, I, II, and III are possible

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3) Let $y = e^x \Rightarrow Ay + \frac{B}{y} = A + B$

$y = 1$ or $y = \frac{B}{A} \Rightarrow e^x = 1$ or $e^x = \frac{B}{A}$

D

so $x = 0$ or $\ln B - \ln A$

sum $= \ln B - \ln A$

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4) $\sum_{x=0}^{\infty} 2^{-x} = 2 \Rightarrow 3^2 = 9$

B

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5) $x + \frac{1}{x} = 3 \Rightarrow x^2 + 2 + \frac{1}{x^2} = 9$

$x^2 + \frac{1}{x^2} = 7$

A

$(x + \frac{1}{x})^3 = x^3 + 3x + \frac{3}{x} + \frac{1}{x^3} = 27$

$x^3 + \frac{1}{x^3} + 3(x + \frac{1}{x}) = 27 \Rightarrow x^3 + \frac{1}{x^3} = 18$

$3 + 7 + 18 + 1 = 29$

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6) J: $1000(1.13) = \$1130$

W: $1000\left(1 + \frac{.13}{12}\right)^{12} = \$1138.03$

$\$1138.03 - \$1130 = \$8.03$

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7) $t_4 = 2\log 3$ $\quad t_7 = 5\log 3$

$t_1 = -\log 3$ $\quad d = \log 3$

Sum of first 10 terms $= 35\log$

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8) $B\log_A x + B\log_x A = B^2 + 1$

Let $y = \log_A x$

$y + \frac{1}{y} = B + \frac{1}{B} \Rightarrow y = B$

$\therefore \log_A x = B \Rightarrow x = A^$

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9) $2 + 3x - x^3 = 0$ at $x = 2$ and x

function exists on $x < 2$ as long as $x \neq -1$

$\therefore$ range is $<-\infty, -1> \cup <-1,$

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10) $\frac{7!}{3!2!2!} x^3 (-y)^2 (3z)^2$ **D**

$210(1)(1)(9) = 1890$

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11) Let $y = \log x$

$y = \sqrt{2 + y} \Rightarrow y^2 = y + 2$ **B**

$y^2 - y - 2 = 0 \Rightarrow y = 2$ or $-$

$\log x = 2 \Rightarrow x = 100$

$\log x = -1 \Rightarrow x = 1/10$ (extrane

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12) $\frac{\log x}{\log 2} + \frac{\log x}{\log 7} = \log_2 6$

$\log x(\log 3 + \log 2) = \frac{\log 6}{\log 2} \cdot \log 3 \cdot$

$\log x \cdot \log 6 = \log 6 \cdot \log 3$ **D**

$\log x = \log 3 \Rightarrow x = 3$

D) $100 = A_0 e^{60k}$, $70 = A_0 e^{8k}$ $\Big\} \frac{10}{7} = e^{-2k} \Rightarrow k \approx -0.178$

$\frac{1}{2} = e^{kt} \Rightarrow t = \frac{\ln(\frac{1}{2})}{k} \approx 3.89$

14) $2x^4+2x^3+5x^2+6x+1 = (x+1)^4$

for $x = 0, 1, 2, -1$

B) $\Rightarrow$ 0 and -1 are extraneous because 1 and 0 cannot be bases

$\therefore x = 1$ or $2 \Rightarrow$ Sum $= 3$

15) $xy = x^2 + 4y^2 - 4xy$

$x^2 - 5xy + 4y^2 = 0$

$(x-y)(x-4y) = 0$

C) $x = y$ or $x = 4y$

but $x \neq y$, so

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

16) $1 + 2^n + 2^{2n} + 2^{3n} = 85$

B) when $n = 2$

17) I. $2^{17}i$ II. 1

III. $16+16i$ IV. $\frac{1}{8}i$

C) I & IV only

18) $3x = 4(x+2)$

$3x = 4x + 8$

D) $x = -8$

19) $2x = 12 + 2y$

B) $y = x - 6 \Rightarrow$ single line

20) $56_8 = 46_{10}$

A) $(46_{10})^3 = 97336_{10}$

$97336_{10} = 276070_8$

$2^{\sqrt{-x}} \geq 1$ always

22) Degree 13 B

23) Let $y = 2^x \Rightarrow y^2 - 5y + 4 = 0$

$(y-4)(y-1) = 0$ A

$y = 4$ or 1

$2^x = 4$ or $2^x = 1 \Rightarrow x = 2$ or 0

sum $= 2$

24) $x + y = 9$ $\quad 3x - y = x$

$y = 2x$ A

$2x + x = 9$

$3x = 9$

$x = 3 \Rightarrow y = 6$

$(3, 6)$

25) $x^2 - 3x + 2 = 0$ for $x = 1, 2$

$x^2 - 5x + 5 = 1$ for $x = 1, 4$ D

$x^2 - 5x + 5 = -1$ for $x = 2, 3$

Sum $= 1+2+3+4 = 10$

26) $y_1 = \frac{kA}{B^c}$ $\quad y_2 = \frac{k(2A)}{(2B)^{c+1}} = \frac{2kA}{2^c \cdot B^c \cdot 2 \cdot B}$

$\frac{\cancel{2}kA}{2^c \cancel{B^c} \cdot \cancel{2} \cdot B} \cdot \frac{B^c}{\cancel{kA}} = \frac{1}{B \cdot 2^c}$ I

27) $3\log_2 x = 9 \Rightarrow \log_2 x = 3 \Rightarrow x = 8$ B

28) $(x)^{-2/3} \cdot (2)^2 \cdot \frac{\frac{4}{3} \cdot \frac{1}{3} \cdot (-\frac{2}{3})!}{(-\frac{2}{3})!\, 2!} = \frac{2}{9} \cdot 4 \cdot x^{-2/3}$

$= \frac{8}{9} x^{-2/3}$ D

29) $\frac{1}{a+b+c}\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)\left(\frac{1}{ab+bc+ac}\right)\left(\frac{1}{ab}+\frac{1}{bc}+\frac{1}{ac}\right)$

$\left(\frac{1}{\cancel{a+b+c}}\right)\left(\frac{ab+bc+ac}{abc}\right)\left(\frac{1}{\cancel{ab+bc+ac}}\right)\left(\frac{a+b+c}{abc}\right) = \frac{9}{16}$ A

$\left(\frac{1}{abc}\right)^2 = \frac{9}{16} \Rightarrow abc = 4/3$

30) $\log\sqrt{x} = \log 2 \Rightarrow x \geq 4$ E