AFM- Exponents & Logs Test Review - KEY

FUNCTIONS

1. $y = 5(1.2)^x$ is exponential **growth** $(b > 1)$

2. $(0, 2)$ and $(2, 32)$

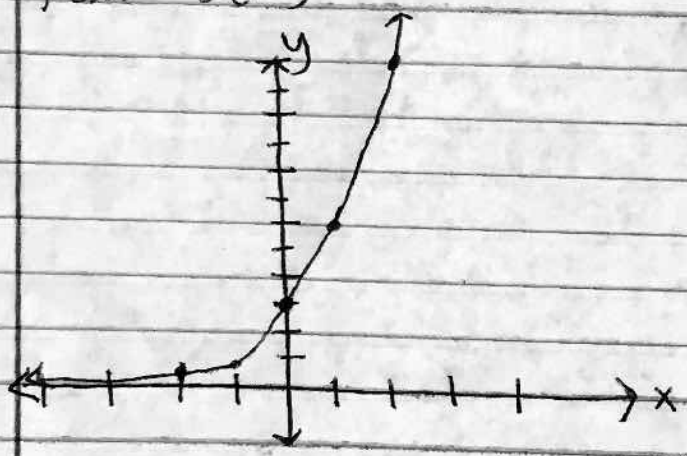
$2 = a(b)^0$ → $2 = a(1)$ → $2 = a$

$32 = a(b)^2$ → $32 = 2(b)^2$ → $16 = b^2$ → $\pm 4 = b$

$y = 2(4)^x$

~~or $y = 2(-4)^x$~~ $b > 0$

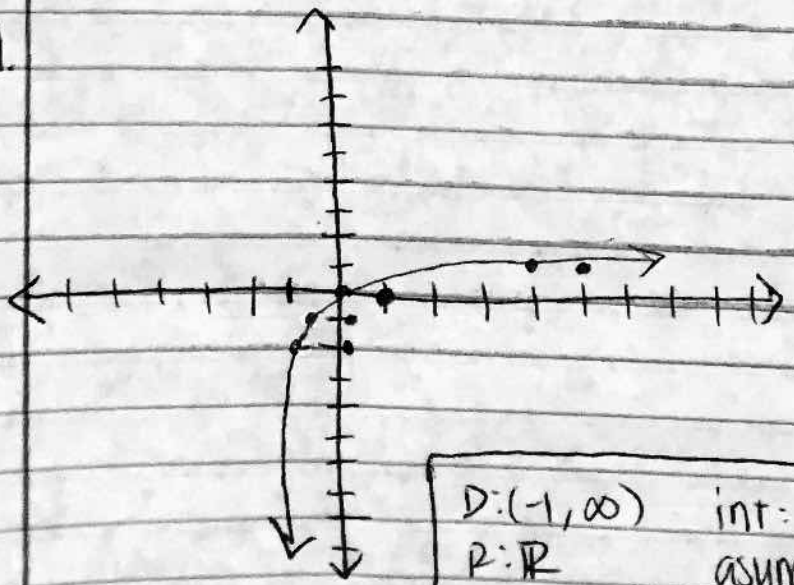
3. $f(x) = 3(2)^x$



x	y
-2	3/4
-1	3/2
0	3
1	6
2	12

D: $\mathbb{R}$
R: $(0, \infty)$
y-int: $(0, 3)$
asymp: $y = 0$

4.



$y = 4^x \Rightarrow y = \log_4(x)$

x	y
-2	1/16
-1	1/4
0	1
1	4
2	16

x	y
1/16	-2
1/4	-1
1	0
4	1
16	2

then left 1

D: $(-1, \infty)$ int: $(0, 0)$
R: $\mathbb{R}$ asymp: $x = -1$

EXPONENTIAL EQUATIONS

5. $25^{2x} = 125^{x+2}$

$5^{2(2x)} = 5^{3(x+2)}$

$4x = 3x + 6$

$\boxed{x = 6}$

6. $2187^{x-9} = 81^{3x-7}$

$3^{7(x-9)} = 3^{4(3x-7)}$

$7x - 63 = 12x - 28$

$-7x + 28 \quad -7x + 28$

$-35 = 5x$

$\boxed{-7 = x}$

LOGS

7. $4^6 = 4096$

$\boxed{\log_4 4096 = 6}$

8. $\log_9 27 = \frac{3}{2}$

$\boxed{9^{3/2} = 27}$

9. $\log_2(x+6) = 5$

$2^5 = x + 6$

$32 = x + 6$

$\boxed{26 = x}$

10. $3^{4x} = 3^{3-x}$

$4x = 3 - x$

$5x = 3$

$\boxed{x = 3/5}$

11. $\log_5(4x-1) = \log_5(3x+2)$

$4x - 1 = 3x + 2$

$\boxed{x = 3}$

12. $\log_2(9x+5) = 2 + \log_2(x^2-1)$

$\log_2(9x+5) - \log_2(x^2-1) = 2$

$\log_2\left(\frac{9x+5}{x^2-1}\right) = 2$

$2^2 = \frac{9x+5}{x^2-1}$

$4(x^2-1) = 9x+5$

$4x^2 - 4 = 9x + 5$

$4x^2 - 9x - 9 = 0$

$(4x^2 - 12x) + (3x - 9) = 0$

$4x(x-3) + 3(x-3) = 0$

$(4x+3)(x-3) = 0$

-36

-12 3

-9

$4x + 3 = 0 \quad x - 3 = 0$

$x = -3/4$ $\quad \boxed{x = 3}$

13. $2^{x-3} = 5$

$\log(2^{x-3}) = \log 5$

$(x-3)\log 2 = \log 5$

$x = \frac{\log 5}{\log 2} + 3$

$\boxed{x \approx 5.3219}$

14. $\log_6 48 - \log_6 \frac{16}{5} + \log_6 5 = \log_6 5x$

$\log_6\left(\frac{48 \cdot 5}{\frac{16}{5}}\right) = \log_6 5x$

$\log_6(75) = \log_6 5x$

$75 = 5x$

$\boxed{15 = x}$

NATURAL LOGS & e

15. $\ln(x+4) = 5$

$e \qquad e$

$x + 4 = e^5$

$x = e^5 - 4$

$\boxed{x = 144.4132}$

16. $-4e^{2x} + 15 = 7$

$-4e^{2x} = -8$

$e^{2x} = 2$

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

$2x = \ln 2$

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

$\boxed{x \approx .34166}$

17. $\ln x + \ln 4x = 10$

$e^{\ln(4x^2)} = e^{10}$

$4x^2 = e^{10}$

$x^2 = \frac{e^{10}}{4}$

$x = \pm\sqrt{\frac{e^{10}}{4}}$

$x = e^5/2$

$\boxed{x \approx 74.2066}$

18. $5^{5x-2} = 2^{2x+1}$

$\log(5^{5x-2}) = \log(2^{2x+1})$

$(5x-2)\log 5 = (2x+1)\log 2$

$5x\log 5 - 2\log 5 = 2x\log 2 + \log 2$

$5x\log 5 - 2x\log 2 = 2\log 5 + \log 2$

$x(5\log 5 - 2\log 2) = 2\log 5 + \log 2$

$x = \frac{2\log 5 + \log 2}{5\log 5 - 2\log 2}$

$\boxed{x \approx .5873}$

EXPONENTIAL GROWTH & DECAY

19. $A = Pe^{rt}$

$\frac{1}{2}P = Pe^{r(26)}$

$\frac{1}{2} = e^{26r}$

$\ln(\frac{1}{2}) = \ln(e^{26r})$

$\ln(\frac{1}{2}) = 26r$

$\frac{\ln(\frac{1}{2})}{26} = r$

$r \approx -.0267$

$\approx \boxed{2.7\%}$

20. $A = P\left(1 \pm \frac{r}{n}\right)^{nt}$

$A = 3500000\left(1 + \frac{.011}{1}\right)^{1(30)}$

$A = 3500000(1.011)^{30}$

$A = 4859624.491$

$\approx$ **4,859,624 people**

21. $A = P\left(1 \pm \frac{r}{n}\right)^{nt}$ $n = 1$ (per hour)

$A = P(1 + r)^t$

$250 = 100(1 + r)^8$

$2.5 = (1 + r)^8$

$\sqrt[8]{2.5} = 1 + r$

$\sqrt[8]{2.5} - 1 = r$

$.1214 \approx r$

$12.14\% \approx r$

22. $A = P\left(1 \pm \frac{r}{n}\right)^{nt}$ $n = 1$ (1 time per year - annual)

$A = 3000\left(1 + \frac{.0325}{1}\right)^{1(12)}$

$A = 3000(1.0325)^{12}$

$A = \$4403.54$