Test 2A Review

* Problems are done in numerical order

21) $\log(3-x)+\log(x) = \log((x-3)x) = \boxed{\log(x^2-3x)}$

23) $2\ln(x)+\ln(y)+\ln(3)$

$\boxed{\ln(3x^2y)}$

24) $3\log_2(x) - 2\log_2(y) + \log_2(z)$

$\boxed{\log_2\left(\frac{x^3z}{y^2}\right)}$

25) $\log(3x^4) = \boxed{\log(3)+4\log(x)}$

27) $\log_3\left(\frac{5\sqrt{x}}{y^4}\right) = \boxed{\log_3(5)+\frac{1}{2}\log_3(x)-4\log_3(y)}$

33) $\log(x) = 10$ $\quad \boxed{x=10^{10}}$

35) $\log_x(81) = 4$ $\quad \sqrt[4]{x^4}=\sqrt[4]{81} \Rightarrow \boxed{x=\pm 3}$

37) $\log_{1/3}(27) = x+2$ $\quad \ln\left(\frac{1}{3}\right)^{x+2} = \ln 27$

$(x+2)(\ln(1)-\ln(3)) = \ln 27$

$-(x+2)\ln(3) = \ln 27$

$-(x+2) = \frac{\ln 27}{\ln 3}$

$-x-2 = \frac{\ln 27}{\ln 3}$

$-x = \frac{\ln 27}{\ln 3}+2$

$x = -2-\frac{\ln 27}{\ln 3}$

$\boxed{x=-5}$

39) $3^{x+2} = \frac{1}{9}$

$(x+2)\ln 3 = \ln(1) - 2\ln(3)$ ($\ln(1) = 0$)

$x+2 = -\frac{2\ln 3}{\ln 3}$

$x+2 = -2$

$\boxed{x = -4}$

41) $e^{x-2} = e^{9}$

$(x-2) = \ln 9$

$x = 2 + 2\ln 3$

$= 4.197$

43) $4^{x+3} = \frac{1}{2^x}$

$(x+3)\ln 4 = \ln 1 - x\ln 2$ ($\ln 1 = 0$)

$x\ln 4 + 3\ln 4 = -x\ln 2$

$x\ln 4 + x\ln 2 = -3\ln 4$

$x(\ln 4 + \ln 2) = -3\ln 4$

$x = \frac{-3\ln 4}{\ln 4 + \ln 2}$

$\boxed{x \approx -2}$

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

$\log(2x^2) = 5$

$10^{\log(2x^2)} = 10^5$

$2x^2 = 10^5$

$x^2 = \frac{10^5}{2}$

$\boxed{x = \pm\sqrt{\frac{10^5}{2}} \approx 223.607}$

47) $\log_2(x) + \log_2(x-4) = \log_2(x+24)$

$\log_2(x^2-4x) = \log_2(x+24)$

$x^2-4x = x+24$

$x^2-5x-24=0$ Non real

$(x-8)(x+3)$ $x = -3, 8$

49) $2\ln(x+2) = 3\ln(4)$

$\ln(x+2)^2 = \ln(64)$

$(x+2)^2 = 64$

$x^2+4x+4 = 64$

$x^2+4x-60=0$ Non real

$(x+10)(x-6)$ $x = -10, 6$

$\boxed{x=6}$

51) $x\log(4) = 6 - x\log(25)$

$x\log(4) + x\log(25) = 6$

$x(\log(4) + \log(25)) = 6$

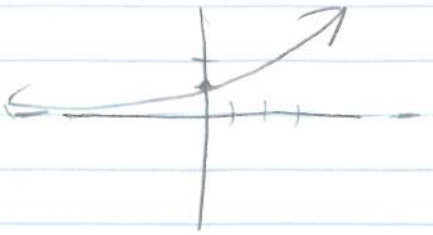
$x\log(100) = 6$

$\log(100^x) = 6$

$100^x = 10^6$

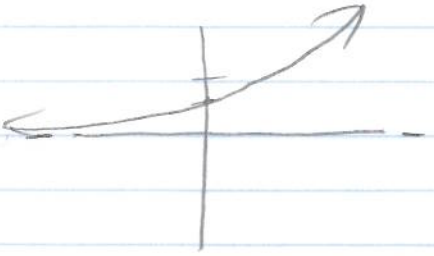
$\boxed{x=3}$

63) $f(x) = 5^x$



$b = 5$ growth
H.A. $y = 0$
D: $\mathbb{R}$
R: $(0, \infty)$
Inc: $\mathbb{R}$
Dec: Never

64) $F(x) = e^x$



$b = e$ growth
H.A. $y = 0$
D: $\mathbb{R}$
R: $(0, \infty)$
Inc: $\mathbb{R}$
Dec: Never

67) $y = \log_3 x$

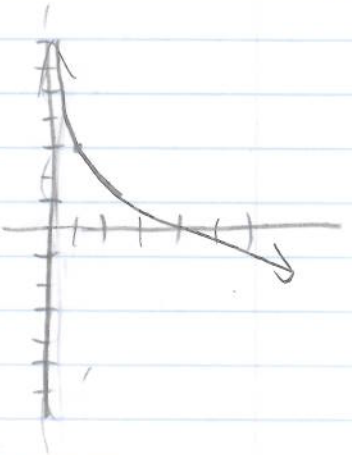
$b = 3$ Growth
V.A. $x = 0$
D: $(0, \infty)$
R: $\mathbb{R}$
Inc: $\mathbb{R}$
Dec: Never

69) $y = 1 + \ln(x+3)$

$b = e$ growth
Left 3
up 1
V.A. $x = 3$
D: $(3, \infty)$
R: $\mathbb{R}$
Inc: $\mathbb{R}$
Dec: Never

70) $3 - \log_2(x) = f(x)$

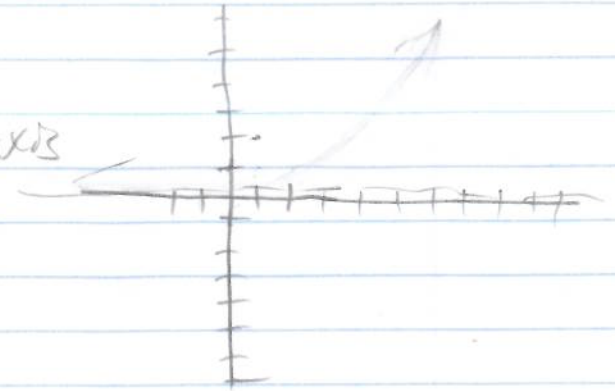
$b = 2$ growth
reflected across the x-axis
No stretch or shrink
No horizontal shift
up 3
V.A. $x = 0$
D: $(0, \infty)$
R: $\mathbb{R}$
Inc: Never
Dec: $\mathbb{R}$



71) $F(x) = 1 + 2^{x-1}$

$b = 2$ growth

No reflection across x-axis



right 1

up 1

H.A. $y = 1$

D: $\mathbb{R}$

R: $(1, \infty)$

Inc: $\mathbb{R}$

Dec: Never

72) $F(x) = 3 - 2^{x+1}$

$b = 2$ growth

reflect over x-axis

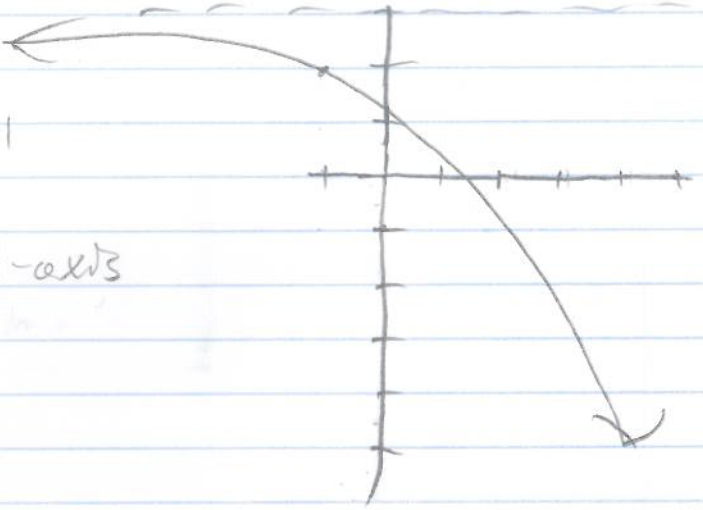
left 1

up 3

H.A. $y = 3$

D: $\mathbb{R}$

R: $(3, \infty)$



83) $3^x = 10$

$x \ln 3 = \ln 10$

$x = \frac{\ln 3}{\ln 10} \approx 0.477$

84) $4^{2x} = 12$

$2x \ln 4 = \ln 12$

$4x \ln 2 = \ln 12$

$4x = \frac{\ln 12}{\ln 2}$

$$x = \frac{\ln 12}{4 \ln 2} \approx 0.896$$

85) $\log_3(x) = 1.876$

$3^{\log_3(x)} = 3^{1.876}$

$$x = 3^{1.876} \approx 7.854$$

86) $\log_5(x+2) = 2.7$

$5^{\log_5(x+2)} = 5^{2.7}$

$x + 2 = 5^{2.7}$

$$x = 5^{2.7} - 2 \approx 75.129$$

87) $5^x = 8^{x+1}$

$\ln 5^x = \ln 8^{x+1}$

$x \ln 5 = (x+1) \ln 8$

$x \ln 5 = x \ln 8 + \ln 8$

$x(\ln 5 - \ln 8) = \ln 8$

$$x = \frac{\ln 8}{\ln 5 - \ln 8} \approx -4.424$$

88) $\ln 3^x = e^{x+1}$

$x \ln 3 = x + 1$

$x(\ln(3) - 1) = 1$

$\boxed{x = \frac{1}{\ln(3) - 1} \approx 10.141}$

89) $\log_3(81) = \log_3(9) \cdot \log_3(9)$

True, because $9(9) = 81$

91) $\ln(3^2) = (\ln(3))^2$

False because it should be $2\ln 3$

93) $\log_2(8^4) = 12$

True, $4 \cdot 3 = 12 \Leftarrow \sqrt[3]{4 \log_2(8)}$

95) $\log(1006) = 3 + \log(6)$

False, First the Cube of 6 is Not 1006 it is 216 and it is Not added but multiplied.

97) $\frac{\log_2 8}{\log_2 16} = \log_2(8) - \log_2(16)$

False, Misuse of Divison rule

105) $P = 50{,}000 \quad r = 5\% \quad n = 4 \quad t = 18$ years

$50{,}000\left(1 + \frac{.05}{4}\right)^{4(18)} = 122{,}296.01$

106) $Pe^{rt} \quad 30{,}000\, e^{(0.0618)12.25} = 63959.33$

109) $A = 25e^{-0.00032t}$

$t = 0 \quad 25e^{-0} = 25$

$t = 1000 \quad 25e^{-0.32} = 18.154$

$12.5 = 25e^{-0.00032t}$

$\frac{1}{2} = e^{-0.00032t}$

$\ln 1 + \ln 2 = +0.00032t$

$t = \frac{\ln 2}{0.00032} = 2166.085$

111) $f(t) = 40{,}000(1 - e^{-0.0001t})$

$10{,}000 = 40{,}000(1 - e^{-0.0001t})$

$\frac{1}{4} = 1 - e^{-0.0001t}$

$-\frac{3}{4} = +e^{-0.0001t}$

$\frac{\ln 3 - 2\ln 2}{-0.0001} = t = 2876.82$

tying it all together

1) $(x-3)^2 = 4$

$x^2 - 6x + 9 = 4$

$x^2 - 6x + 5 = 0$

$(x-5)(x-1) = 0$

$x = 5, 1$

2) $2\log(x-3) = \log(4)$

$\log_{10}(x-3)^2 = \log_{10}(4)$

$(x-3)^2 = 4$

$x^2 - 6x + 9 = 4$

$x = 5, 1$

3) $\log_2(x-3) = 4$

$(x-3) = 16$

$\boxed{x = 19}$

4) $2^{x-3} = 4$

$(x-3)\ln 2 = 2\ln 2$

$x - 3 = 2$

$\boxed{x = 5}$

5) $(\sqrt{x-3})^2 = (4)^2$

$x - 3 = 16$

$x = 19$ ✓ $\sqrt{19-3} = 4$

$4 = 4$

6) $|x-3| = 4$

$x-3 = -4$ $\qquad$ $x-3 = 4$

$\boxed{x = -1}$ $\qquad$ $\boxed{x = 7}$

7) $x^2 - 4x = -2$

$x^2 - 4x + 2 = 0$ $\qquad \dfrac{4 \pm \sqrt{16 - 4(1)(2)}}{2}$

$\dfrac{4 \pm \sqrt{8}}{2}$ $\qquad \sqrt{8} = 2\sqrt{2}$

$\boxed{2 \pm \sqrt{2}}$

8) $2^{x-3} = 4^x$ $\qquad (x-3)\ln 2 = x \ln 4$

$(x-3)\ln 2 = 2x \ln 2$

$x - 3 = 2x$

$\boxed{-3 = x}$

9) $\left(\sqrt[3]{x-5}\right)^3 = 5^3$

$x - 5 = 125$

$\boxed{x = 130}$

10) $2^x = 3$

$x \ln 2 = \ln 3$

$\boxed{x = \dfrac{\ln 3}{\ln 2}}$

11) $\log(x-3) + \log(4) = \log(x)$

$\log(4x-12) = \log(x)$

$10 \qquad 10$

$4x - 12 = x$

$3x - 12 = 0$

$3x = 12$

$x = 4$

12) $x^3 - 4x^2 + x + 6 = 0$ $\quad p = \pm(1, 2, 3, 4)$

$q = \pm 1$

$\frac{p}{q} = \pm(1, 2, 3, 4)$

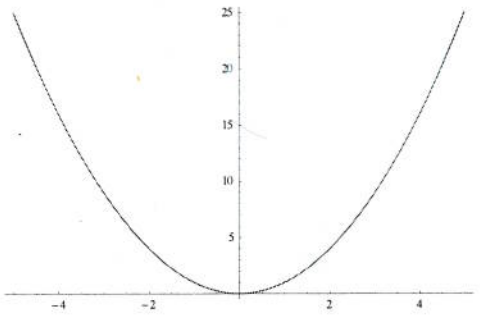
2	1	-4	1	6
		2	-4	-6
	1	-2	-3	0

$x^2 - 2x - 3 = 0$

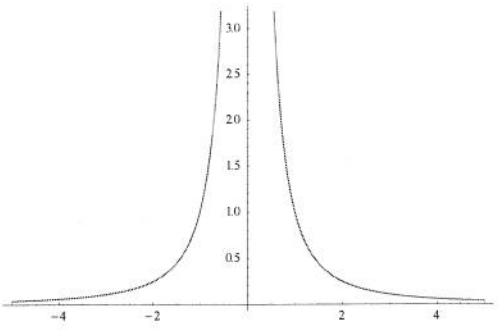
$(x-2)(x+1)(x-3) = 0$

$x = -1, 2, 3$

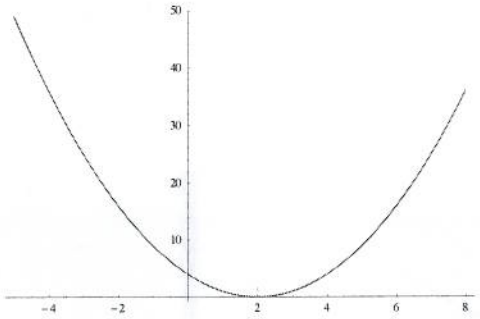
$Y=x^2$



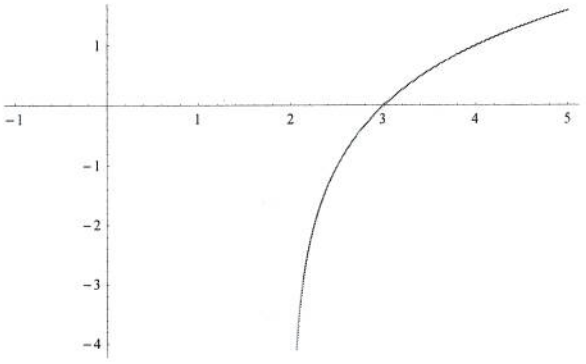
$Y=x^{-2}$



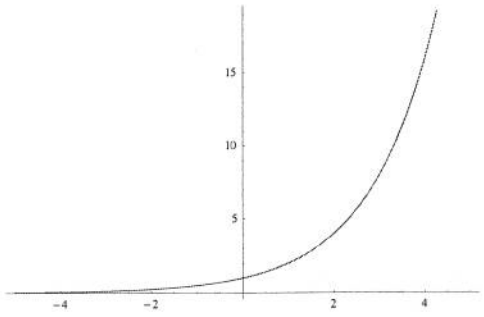
$Y=(x-2)^2$



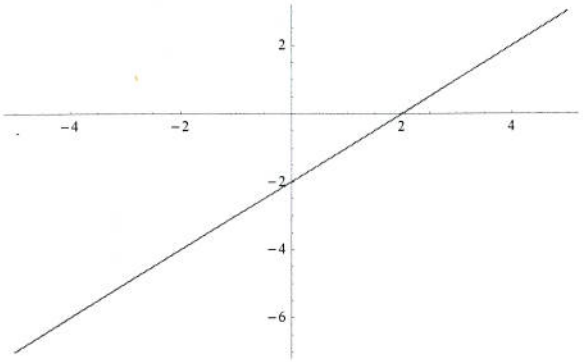
$Y=\log_2(x-2)$



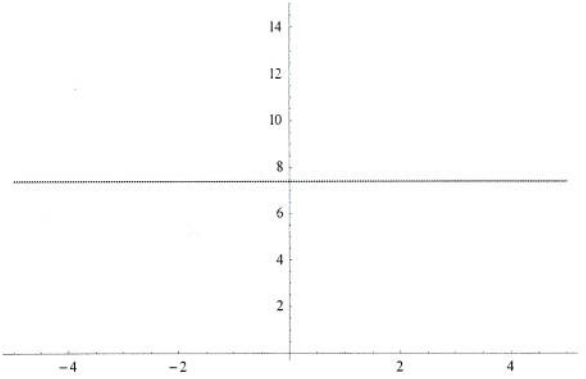
$Y=2^x$



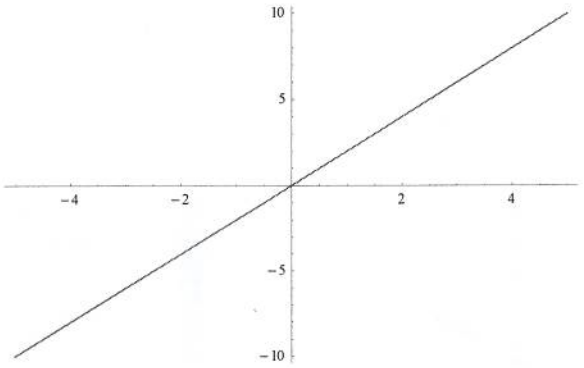
Y=x-2



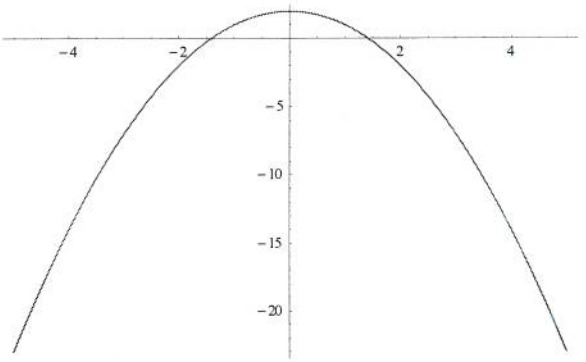
Y=e^2



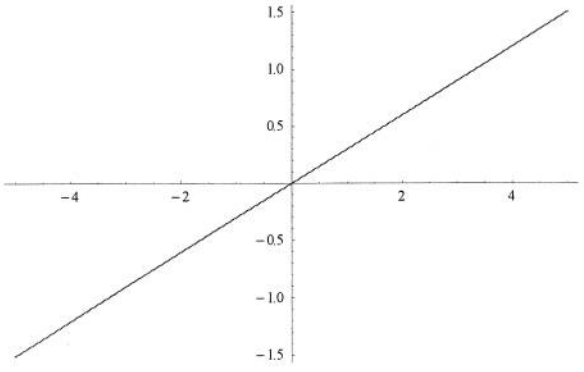
Y=2x



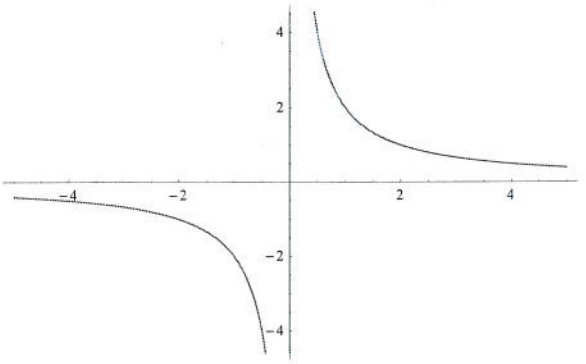
Y=2-x^2



Y=log(2^x)



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



$Y = \frac{1}{x-2}$