CHAPTER 4 REVIEW (Exam has 30 Multiple Choice Questions)

4.R (Pg 371) 1a) $f \circ g\,(2) = ?$

$f(x) = 3x-5$

$g(x) = 1-2x^2$

$g(2) = 1-2(2)^2 = -7$

$f(-7) = 3(-7)-5 = \boxed{-26}$

(10) $f(x) = \sqrt{3x}$

$g(x) = 1+x+x^2$

$f \circ g\,(x) = \sqrt{3(1+x+x^2)} = \boxed{\sqrt{3+3x+3x^2}}$

(17) $f(x) = \dfrac{2x+3}{5x-2}$

$y = \dfrac{2x+3}{5x-2}$

INV: $x = \dfrac{2y+3}{5y-2}$

$x(5y-2) = 2y+3$

$5xy-2x = 2y+3$

$5xy-2y = 2x+3$

$y(5x-2) = 2x+3$

$y = \dfrac{2x+3}{5x-2}$

$\boxed{f^{-1}(x) = \dfrac{2x+3}{5x-2}}$

CHECK

$f\left(\frac{3}{5}\right) = \dfrac{\frac{6}{5}+\frac{15}{5}}{3-2} = \frac{21}{5}$

$f^{-1}\left(\frac{21}{5}\right) = \dfrac{\frac{42}{5}+\frac{15}{5}}{21-2} = \dfrac{\frac{57}{5}}{19}$

$= \frac{3}{5}$ ✓

(27) $\log_5 u = 13$

Convert to Exponential

$5^{13} = u$

(31) Find DOMAIN

$H(x) = \log_2(x^2-3x+2)$

Domain

$x^2-3x+2 > 0$

$(x-1)(x-2) > 0$

+ | − | + (1, 2)

DOMAIN

$(-\infty, 1) \cup (2, \infty)$

(49) $2\log 2 + 3\log x - \frac{1}{2}\log(x+3) - \frac{1}{2}\log(x-2)$

$\log\left(\dfrac{2^2 \cdot x^3}{(x+3)^{1/2}(x-2)^{1/2}}\right) = \log\dfrac{4x^3}{\sqrt{x^2+x-6}}$

(51) $\log_4 19 = \dfrac{\ln 19}{\ln 4} \approx 2.112396$

(67) $\log_x 64 = -3$

$x^{-3} = 64$

$\left[x^{-3}\right]^{-\frac{1}{3}} = \left[2^6\right]^{-\frac{1}{3}}$

$x = 2^{-2}$

$\boxed{x = 1/4}$

(77) $\log_6(x+3) + \log_6(x+4) = 1$

$\log_6\left[x^2+7x+12\right] = 1$

$x^2+7x+12 = 6^1$

$x^2+7x+6 = 0$

$(x+6)(x+1) = 0$

~~$x = -6$~~ Not in Domain

$\boxed{x = -1}$

(79) $e^{1-x} = 5$

$\ln e^{1-x} = \ln 5$

$1-x = \ln 5$

$\boxed{1-\ln 5 = x}$

(43) $\ln\left(\dfrac{x\sqrt[3]{x^2+1}}{x-3}\right)$

$= \ln x + \ln(x^2+1)^{1/3} - \ln(x-3)$

$= \boxed{\ln x + \frac{1}{3}\ln(x^2+1) - \ln(x-3)}$

4.1

⑦ $f \circ g(1) = f[g(1)] = f[0] = \boxed{-1}$

⑨ $(fg)(2) \quad f(2) \cdot g(2) = -2[2] = \boxed{-4}$

Like ㊵ $f(x) = \sqrt{x-2} \quad g(x) = \dfrac{3}{x-4}$ — DOMAIN of $f \circ g$

$$f \circ g = \sqrt{\left(\frac{3}{x-4}\right) - \frac{2}{1}} = \sqrt{\frac{3}{x-4} + \frac{-2x+8}{x-4}}$$

$$f \circ g = \sqrt{\frac{11-2x}{x-4}}$$

Sign chart: $-$ | 4 | $+$ | $11/2$ | $-$

DOMAIN $\left(4, \frac{11}{2}\right]$

4.3 ㊻

$$\left(\frac{1}{4}\right)^x = \frac{1}{64}$$

$$\left(4^{-1}\right)^x = 4^{-3}$$

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

$$-x = -3$$

$$\boxed{x = 3}$$

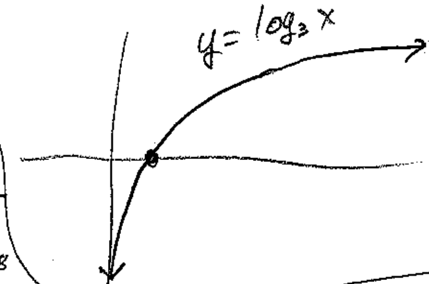
SAMPLE PROBLEM # 8

Bacteria in a 1-liter container doubles every 5 minutes. The container is full After 35 minutes. How long did it take to be $\frac{1}{8}$th full?

Minutes	t	35	30	25	20
Liters	P	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$

20 Minutes

4.4 63–70 Transformations of $y = \log_3 x$



4.6 ⑲ $\log(2x+1) = 1 + \log(x-2)$

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

$$\log\left(\frac{2x+1}{x-2}\right) = 1$$

$$\frac{2x+1}{x-2} = 10^1 = 10$$

$$2x+1 = 10x - 20$$

$$21 = 8x$$

$$\boxed{x = \frac{21}{8}}$$

㊷ $2^{x+1} = 5^{1-2x}$

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

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

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

$$x[\ln 2 + 2\ln 5] = \ln 5 - \ln 2$$

$$x[\ln 2 + \ln 5^2] = \ln\left(\frac{5}{2}\right)$$

$$x[\ln 50] = \ln(5/2)$$

$$\boxed{x = \frac{\ln(5/2)}{\ln 50}}$$

㊼ $P(t) = 304(1.009)^{t-2008}$

$$354 = 304(1.009)^{t-2008}$$

$$\frac{354}{304} = (1.009)^{t-2008}$$

$$\ln\left(\frac{354}{304}\right) = (t-2008)\ln(1.009)$$

$$\frac{\ln\left(\frac{354}{304}\right)}{\ln(1.009)} = t - 2008$$

$$2008 + \frac{\ln\left(\frac{354}{304}\right)}{\ln(1.009)} = t$$

$$2008 + 16.9948$$

$t = \boxed{\text{Year } 2025}$

4.7 ⑧ $A = P\left[1 + \frac{r}{n}\right]^{nt}$

$$A = 50\left[1 + \frac{.06}{12}\right]^{12 \cdot 3}$$

$$\boxed{A = \$59.83}$$

㉒ $A = Pe^{rt}$

$$800 = Pe^{.08(2.5)}$$

$$\frac{800}{e^{.2}} = P \approx \boxed{\$654.98}$$

㉞ $A = P[1+r]^t$

$$3 = 1(1+r)^{10}$$

$$3^{1/10} = \left[(1+r)^{10}\right]^{1/10}$$

$$3^{1/10} = 1 + r$$

$$3^{1/10} - 1 = r$$

$$.116123 = r$$

$$\boxed{r = 11.6123\%}$$

4.8 ㉖d) $N = 1000e^{.01t}$

$$1700 = 1000e^{.01t}$$

$$1.7 = e^{.01t}$$

$$\ln(1.7) = .01t$$

$$100\ln(1.7) = t$$

$$\boxed{t = 53.0628 \text{ Hours}}$$

⑨ $T_{1/2} = 1690$ yrs, $A_0 = 10g$ Find $A(50)$

$$A(t) = A_0e^{kt}$$

$$5 = 10e^{k \cdot 1690}$$

$$\ln(.5) = 1690k \Rightarrow k \approx -.0004101$$

$$A(50) = 10e^{-.0004101(50)}$$

$$= \boxed{9.797\ g}$$

⑭ $U = T + (U_0 - T)e^{kt}$, $T = 38$

t	0	2	?	Minutes
U	72	60	45	°F

$$60 = 38 + (72-38)e^{k \cdot 2}$$

$$k \approx -.217659$$

c) $45 = 38 + 34e^{-.217659t}$

$\boxed{t \approx 7.26113 \text{ Minutes}}$

㉓c $\boxed{P_0 = 30\ g \text{ of Bacteria}}$