MATH 12 — SEC. 5.4 AND 5.5 – SOLUTIONS

5.4 – (30d) $\log_b \sqrt[4]{60} = \log_b 60^{1/4} = \frac{1}{4}\log_b 60 = \frac{1}{4}\log_b(2^2\cdot 3\cdot 5) = \frac{1}{4}\left[\log_b 2^2 + \log_b 3 + \log_b 5\right]$

$= \frac{1}{4}\left[2\log_b 2 + \log_b 3 + \log_b 5\right] = \boxed{\frac{1}{4}\left[2A + B + C\right]}$

(33) $\log_{3b} 15 = \dfrac{\log_b 15}{\log_b(3b)} = \dfrac{\log_b 3 + \log_b 5}{\log_b 3 + \log_b b} = \boxed{\dfrac{B+C}{B+1}}$

(46) $5^{3x-1} = 27 \qquad \ln\left(5^{3x-1}\right) = \ln 27 \qquad (3x-1)\ln 5 = \ln 27 \qquad 3x - 1 = \dfrac{\ln 27}{\ln 5}$

$3x = 1 + \dfrac{\ln 27}{\ln 5} \qquad x = \boxed{\frac{1}{3}\left(1 + \frac{\ln 27}{\ln 5}\right)} = \frac{1}{3}\left(1 + \frac{\ln 3^3}{\ln 5}\right) = \frac{1}{3}\left(1 + \frac{3\ln 3}{\ln 5}\right) = \boxed{\frac{1}{3} + \frac{\ln 3}{\ln 5}}$

(OR use $\log_5 5^{3x-1} = \log_5 27$ so $3x - 1 = \log_5 27 = \dfrac{\ln 27}{\ln 5}$)

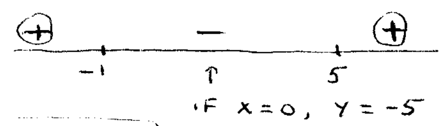
5.5 – (36) $\ln x + \ln(x+1) = \ln 12 \qquad \ln\left(x(x+1)\right) = \ln 12 \qquad x(x+1) = 12$

$x^2 + x = 12 \qquad x^2 + x - 12 = 0 \qquad (x+4)(x-3) = 0 \qquad \cancel{x = -4}$ OR $\boxed{x = 3}$

(DOESN'T CHECK)

(63) $e^{x^2-4x} \geq e^5 \qquad x^2 - 4x \geq 5 \qquad x^2 - 4x - 5 \geq 0$

$(x-5)(x+1) \geq 0$



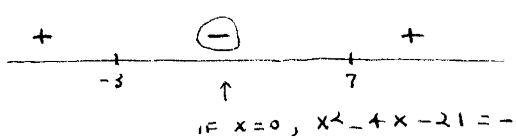
SOLUTION: $\boxed{(-\infty, -1] \cup [5, \infty)}$

(67) a) $y = \ln x + \ln(x-4)$ is defined where $x > 0$ AND $x - 4 > 0$ so $x > 4$:

DOMAIN is $\boxed{(4, \infty)}$

b) $\ln x + \ln(x-4) \leq \ln 21 \qquad \ln\left[x(x-4)\right] \leq \ln 21 \qquad x(x-4) \leq 21$

$x^2 - 4x \leq 21 \qquad x^2 - 4x - 21 \leq 0 \qquad (x-7)(x+3) \leq 0$:



SO x IS IN $\boxed{[-3, 7]}$

SINCE x MUST BE IN $(4, \infty)$ AND IN $[-3, 7]$,

THE SOLUTION IS $\boxed{(4, 7]}$