College Algebra Spr '24
Solutions 6x4n #3hree

① $8^{(2x-4)} = 64$

$\Rightarrow \ln(8^{(2x-4)}) = \ln(64)$

$\Rightarrow (2x-4)\ln(8) = \ln(64)$

$\Rightarrow 2x\ln(8) - 4\ln(8) = \ln(64)$

$\Rightarrow 2x\ln(8) = \ln(64) + 4\ln(8)$

$\Rightarrow x = \dfrac{(\ln(64) + 4\ln(8))}{(2\ln(8))}$

$\Rightarrow \boxed{x = 3}$

② $27^{(5x-2)} = 44^{(3x-4)}$

$\Rightarrow \ln(27^{(5x-2)}) = \ln(44^{(3x-4)})$

$\Rightarrow (5x-2)\ln(27) = (3x-4)\ln(44)$

$\Rightarrow 5x\ln(27) - 2\ln(27) = 3x\ln(44) - 4\ln(44)$

$\Rightarrow 5x\ln(27) - 3x\ln(44) = -4\ln(44) + 2\ln(27)$

$\Rightarrow x(5\ln(27) - 3\ln(44)) = -4\ln(44) + 2\ln(27)$

$\Rightarrow x = \dfrac{(-4\ln(44) + 2\ln(27))}{(5\ln(27) - 3\ln(44))}$

$\Rightarrow x \approx \boxed{-1.67}$

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③ $5e^{(3x+1)} - 17 = 33$

$\Rightarrow 5e^{(3x+1)} = 50$

$\Rightarrow e^{(3x+1)} = 10$

$\Rightarrow \ln(e^{(3x+1)}) = \ln(10)$

$\Rightarrow 3x+1 = \ln(10)$

$\Rightarrow x = \dfrac{(\ln(10)-1)}{3}$

$\Rightarrow x \approx \boxed{.43}$

④ $2.4e^{(4.3x)} - 1.3 = 55.7$

$\Rightarrow 2.4e^{(4.3x)} = 57.0$

$\Rightarrow e^{(4.3x)} = 23.75$

$\Rightarrow \ln(e^{(4.3x)}) = \ln(23.75)$

$\Rightarrow 4.3x = \ln(23.75)$

$\Rightarrow x = \boxed{\dfrac{\ln(23.75)}{4.3}}$

$\Rightarrow x \approx \boxed{.74}$

(5) $\ln(x-6) + \ln(x+1) = \ln(8)$

$\Rightarrow \ln((x-6)(x+1)) = \ln(8)$

$\Rightarrow \ln(x^2-5x-6) = \ln(8)$

$\Rightarrow e^{\ln(x^2-5x-6)} = e^{\ln(8)}$

$\Rightarrow x^2-5x-6 = 8$

$\Rightarrow x^2-5x-14 = 0$

$\Rightarrow x = \frac{-(-5) \pm \sqrt{(-5)^2-4(1)(-14)}}{2(1)}$

$= \frac{5 \pm \sqrt{81}}{2}$

$= \frac{5 \pm 9}{2}$ → $= \frac{5+9}{2} = 7$ or → $= \frac{5-9}{2} = -2$

MUST CHECK

If $x = 7$

$\Rightarrow x-6 = 7-6 = 1 > 0$ ✓

$\Rightarrow x+1 = 7+1 = 8 > 0$ ✓ } $\overset{\text{so}}{\Rightarrow} x = 7$ ✓

If $x = -2$

$\Rightarrow x-6 = -2-6 = -8 \overset{?}{>} 0$ NO $\overset{\text{so}}{\Rightarrow}$ ~~$x = -2$~~

so we have $x = 7$

(6) $\ln(x-2) + \ln(x-3) = 4.5$

$\Rightarrow \ln((x-2)(x-3)) = 4.5$

$\Rightarrow \ln(x^2-5x+6) = 4.5$

$\Rightarrow e^{\ln(x^2-5x+6)} = e^{4.5}$

$\Rightarrow x^2-5x+6 = e^{4.5}$

$\Rightarrow x^2-5x-84.02 = 0$

$\Rightarrow x = \frac{-(-5) \pm \sqrt{(-5)^2-4(1)(-84.02)}}{2(1)}$

$= \frac{5 \pm \sqrt{361.08}}{2}$

$= \frac{5 \pm 19.00}{2}$ → $\frac{5+19.00}{2} = 12.00$ or → $\frac{5-19.00}{2} = -7.00$

MUST CHECK

If $x = 12.00$

$\Rightarrow x-2 = 12-2 = 10 > 0$ ✓

$\Rightarrow x-3 = 12-3 = 9 > 0$ ✓ } $\overset{\text{so}}{\Rightarrow} x = 12$ ✓

If $x = -7.00$

$\Rightarrow x-2 = -7-2 = -9 > 0$ NO

so ~~$x = -7.00$~~

so we have $x = 12.00$

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(5) ?

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$\Rightarrow x+1 = 7+1 = 8 > 0$ ✓ } $\Rightarrow$ so $x = 7$ ✓

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If $x = -7.00$

$\Rightarrow x-2 = -7-2 = -9 > 0$ NO

so ~~$x = -7.00$~~

so we have $x = 12.00$