3/19 TUE

3.4 (part 1) Exponential Equations

10^x log e^x ln *

→ Common base? If $a^m = a^n$, then $m = n$.

ex 1) $2^x = 64$ ($64 = 32 \cdot 2 = 16 \cdot 2 \cdot 2 = 4 \cdot 2 \cdot 2 \cdot 2$) → $2^x = 2^6$ → $x = 6$

ex 2) $2^{2x-1} = 32$ → $2^{2x-1} = 2^5$ → $2x - 1 = 5$ → $x = 3$

ex 3) $32^x = 8$ → $(2^5)^x = 2^3$ → $2^{5x} = 2^3$ → $5x = 3$ → $x = \frac{3}{5}$

ex 4) $6^{\frac{x-3}{4}} = \sqrt{6}$ → $6^{\frac{x-3}{4}} = 6^{\frac{1}{2}}$ → $\frac{x-3}{4} = \frac{1}{2} = 2(x-3) = 1(4)$

ex 5) $e^{x+1} = \frac{1}{e}$ → $e^{x+1} = e^{-1}$ → $2x - 6 = 4$ → $x = 5$ → $x = -2$

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Hint: apply the inverse OR ln (log) both sides

ex 6) $10^x = 3.91$ * log both sides

$\log 10^x = \log 3.91$

$x = \log 3.91 \approx 0.59$

OR convert to log form: $\log_{10} 3.91 = x$

ex 7) $e^x = 5.7$ * ln both sides

$\ln e^x = \ln 5.7$

$x = \ln 5.7 \approx 1.74$

ex 8) $5^x = 17$ * ln both sides

$\ln 5^x = \ln 17$ (* Power Property)

$x \ln 5 = \ln 17$ → $x = \frac{\ln 17}{\ln 5} \approx 1.76$

ex 9) $3e^{5x} = 1977$ → $\frac{3e^{5x}}{3} = \frac{1977}{3}$ → $e^{5x} = 659$

→ $\ln e^{5x} = \ln 659$ → $5x = \ln 659$ → $x = \frac{\ln 659}{5} \approx 1.30$

ex 10) $e^{5x-3} - 2 = 10.476 \rightarrow e^{5x-3} = 12.476$

(+2 / +2)

$\rightarrow \ln e^{5x-3} = \ln 12.476 \rightarrow 5x-3 = \ln 12.476 = \frac{(\ln 12.476 + 3)}{5} \approx$ **1.10**

ex 11) $7^{2x+1} = 3^{x+2}$ * ln both sides

Do $5^{2x+3} = 3^{x-1}$ next time

$\ln 7^{2x+1} = \ln 3^{x+2}$ * power prop

$(2x+1)\ln 7 = (x+2)\ln 3$ * isolate x → distribute

$2x\ln 7 + \ln 7 = x\ln 3 + 2\ln 3$

$2x\ln 7 - x\ln 3 = 2\ln 3 - \ln 7$ * factor out an x

$x(2\ln 7 - \ln 3) = 2\ln 3 - \ln 7$

$x = \frac{2\ln 3 - \ln 7}{2\ln 7 - \ln 3} \approx$ **0.09**

HW: p432, ~~#2-42 even~~ 2-40 even, 41