Sec 4.4
Solving Exponential Equations

Solve-

$10^X = 8.07$

$e^X = .83$

$\log 10^X = \log 8.07$ $\ln e^X = \ln .83$

$X \log 10 = \log 8.07$ $X \ln e = \ln .83$

$X = \log 8.07$ $X = \ln .83$

$\approx .907$ $\approx -.186$

$e^{4x-5} - 7 = 11{,}243$

$\ln e^{4x-5} = \ln 11250$

$4x - 5 = \ln 11250$

$+5$

$\div 4$

$x \approx 3.58$

$$7^{2x+1} = 3^{x+2}$$

$$\log 7^{2x+1} = \log 3^{x+2}$$

$$(2x+1)\log 7 = (x+2)\log 3$$

$$1.69x + .845 = .477x + .954$$

$$1.213x = .109$$

$$x \approx .089$$

$e^{2x} - 2e^{x} - 3 = 0$ $\left(e^{x}\right)^{2} - 2e^{x} - 3$

Use "u" substitution

Let $u = e^{x}$

$$u^{2} - 2u - 3 = 0$$

$$(u-3)(u+1) = 0$$

$$u = 3 \text{ & } u = -1$$

$\ln 3 = \ln e^{x}$

$= x \ln e$

$\boxed{\ln 3 = x}$

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

$= x \ln e$

$\ln -1 = x$

$\varnothing$

$e^{4x} - 3e^{2x} - 18 = 0$

Rewrite-
$(e^{2x})^2 - 3e^{2x} - 18 = 0$
So, let $u = e^{2x}$

$2^{2x} + 2^x - 12 = 0$
Rewrite-
$(2^x)^2 + 2^x - 12 = 0$
Let $u = 2^x$

$u^2 + u - 12 = 0$
$(u+4)(u-3) = 0$
$u = -4 \text{ \& } 3$

$3 = 2^x$
$\log 3 = \log 2^x$
$\log 3 = x \log 2$
$\dfrac{\log 3}{\log 2}$

$x \approx 1.58$

now -4

$-4 = 2^x$

$\log -4 = \log 2^x$ ← cannot take log of a negative so no solution here

$u^2 - 3u - 18 = 0$
$(u-6)(u+3) = 0$
$u = 6 \text{ \& } -3$

$6 = e^{2x}$
$\ln 6 = \ln e^{2x}$
$\ln 6 = 2x$
$\dfrac{\ln 6}{2} = x$ ← one answer

$-3 = e^{2x}$
$\ln -3 = \ln e^{2x}$ ← cannot, so no solution here

Suggested Practice
Sec 4.4 page 490
23-47
odds

23. .59

25. 1.74

27. 1.76

29. 1.53

31. 1.3

33. −1.14

35. 2.45

37. 1.09

39. 11.48

41. −2.8

43. .69

45. .55

47. 0