Classwork 13, MATH 1113 Harrison Chapman

Name: Key

8:00 | or | 9:30

1. Approximate by using the change of base formula. Include at least 3 decimals in your answer.

a) $\log_8(63) \approx 1.9924$

b) $\log_5(17) \approx 1.7604$

c) $\log_{23}(11) \approx 0.7648$

d) $\log_{6.6}(66) \approx 2.2202$

e) $\log_{0.5}(3) \approx -1.58496$

2. Solve the equation

$$4^{5x+13} = 6^{7-8x}$$

$$\ln\left(4^{(5x+13)}\right) = \ln\left(6^{(7-8x)}\right)$$

$$(5x+13)\ln(4) = (7-8x)\ln(6)$$

$$(5\ln(4))x + 13\ln(4) = 7\ln(6) - (8\ln(6))x$$

$$(5\ln(4))x + (8\ln(6))x = 7\ln(6) - 13\ln(4)$$

$$(5\ln(4) + 8\ln(6))x = 7\ln(6) - 13\ln(4)$$

$$\boxed{x = \frac{(7\ln(6) - 13\ln(4))}{(5\ln(4) + 8\ln(6))}}$$

3. Solve the equation

$$(e^x)^2 - 8e^x + \frac{48}{4} = 0$$

quadratic in "e^x":

$$e^x = \frac{8 \pm \sqrt{64 - 4(1)(\frac{48}{4})}}{2} = \frac{8 \pm \sqrt{64-48}}{2}$$

$$= \frac{8 \pm \sqrt{16}}{2} = \frac{8 \pm 4}{2} = 4 \pm 2$$

So $e^x = 4+2 = 6$ & $e^x = 4-2 = 2$ $\Big\}$ $\underline{\underline{\text{so}}}$ $\boxed{x = \ln(6) \text{ \& } x = \ln(2)}$

important final answer.

4. Solve the compound interest formula for t using only natural logarithms:

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$\ln(A) = \ln\left(P\left(1+\frac{r}{n}\right)^{nt}\right)$$

$$\ln(A) = \ln(P) + \ln\left(\left(1+\frac{r}{n}\right)^{nt}\right)$$

$$\ln(A) = \ln(P) + nt\ln\left(1+\frac{r}{n}\right)$$

$$\ln(A) - \ln(P) = nt\ln\left(1+\frac{r}{n}\right)$$

$$\boxed{\frac{\ln(A)-\ln(P)}{n\ln\left(1+\frac{r}{n}\right)} = t}$$

5. Solve the equation

$$e^x - 40e^{-x} = -6$$

$*e^x$ $*e^x$

$$(e^x)^2 - 40 = -6e^x$$

quadratic in e^x

$$(e^x)^2 + 6e^x - 40 = 0$$

$$e^x = \frac{-6 \pm \sqrt{36 - 4(-40)}}{2} = \frac{-6 \pm \sqrt{196}}{2}$$

$$= \frac{-6 \pm 14}{2}$$ so $e^x = \frac{-20}{2} = -10$ X can't happen! (why?)

so $e^x = \frac{8}{2} = 4$

$$\boxed{x = \ln(4)}$$