Assignment 6242

Name ______________________

① Condense

a) $\log(7) + x\log(3)$

$\log(7) + \log(3^x)$

$\log(7 \cdot 3^x)$

b) $\underbrace{\ln(m) - \ln(n)} - \ln(p)$

$\ln\left(\frac{m}{n}\right) - \ln(p)$

$\ln\left(\frac{\frac{m}{n}}{\frac{p}{1}}\right) = \ln\left(\frac{m}{np}\right)$

$\frac{m}{n} \cdot \frac{1}{p}$

② Expand

a) $\ln\left(\frac{9x}{y}\right)$

$\ln(9x) - \ln(y)$

$\ln(9) + \ln(x) - \ln(y)$

b) $\log(mn)^3$

$\log[m^3 n^3]$

$\log[m^3] + \log[n^3]$

c) $\log 7(2x-3)^2$

careful

$\log[7] + \log[(2x-3)^2]$

③ Determine the value in a bank account 20 years later of an initial investment of \$4,000 assuming an annual interest rate of 6.5% and with monthly compounding.

$$FV = 4000\left(1 + \frac{.065}{12}\right)^{12 \cdot 20} \approx \$14{,}625.79$$

repeat if compounding continuously. [Use $F = P \cdot e^{rt}$]

$$F = 4000\, e^{.065 \cdot 20} \approx \$14{,}677.19$$

④ How long would it take to double your money with continuous compounding and an annual interest rate of 7%. (Use $F = Pe^{rt}$) Hint: make up any amount of \$ to start with.

start with 10
end with 20

$20 = 10e^{.07t}$

divide

$2 = e^{.07t}$

$\ln(2) = \ln(e^{.07t})$

$\ln(2) = .07t \cdot \ln(e)$

$t = \frac{\ln(2)}{.07 \cdot \ln(e)}$

$\approx$ 9.90 years to double your \$

⑤ Solve the equation

$\ln(4r^2) = 3$

base is e
exp. is 3

$e^3 = 4r^2$

$r^2 = \frac{e^3}{4}$

$r = \pm\sqrt{\frac{e^3}{4}}$

but r can't be negative!

⑥ Solve $e^n = 5$

↓ convert to log form
base e exponent is n

$n = \ln(5)$

≈ 1.609

(7) Solve $2e^{x-5} = 80$
divide

$e^{x-5} = 40$

$\ln(e^{x-5}) = \ln(40)$

$(x-5)\ln e = \ln(40)$

$x-5 = \frac{\ln(40)}{\ln(e)}$

$x = \frac{\ln(40)+5}{\ln(e)}$

$x = \ln(40)+5$

(8) $5\ln x - \ln x^3 = 10$ solve
condense

$\ln\left(\frac{x^5}{x^3}\right) = 10$

$\ln(x^2) = 10$

$x^2 = e^{10}$

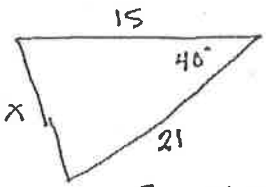
$x = \pm\sqrt{e^{10}}$

but x can't be (−)

so $x = \sqrt{e^{10}}$

(9) From Geometry

LAW of COSINES

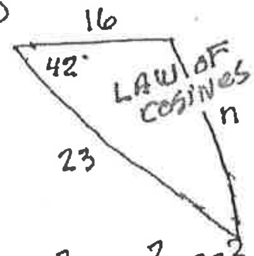


$x^2 = 15^2+21^2-2(15)(21)\cos 40°$

$x^2 = 183.392\ldots$

$x = 13.54$

(10)



Use your reference sheet !!!

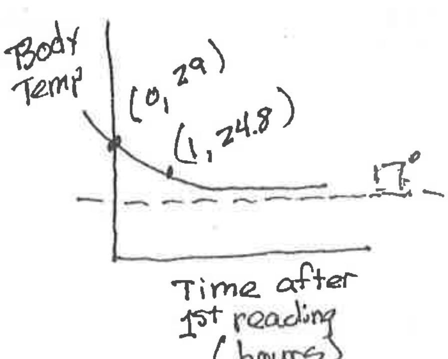
$n^2 = 16^2+23^2-2(16)(23)\cdot\cos(42°)$

$n^2 = 238.045\ldots$

$n = 15.429$

(11) The Case of the Cooling Corpse (re-visited)
It turned out agent 008 made a mistake when measuring the temperatures. Instead of the initial reading of 27, it was actually 29°C, and the reading 1 hour later was 24.8°C. The room temperature remember was 17°C.

a) Determine the general equation
b) Determine the time of death (Dr. Dedman died when his normal body temp was 37°C.)



$(0, 29)$ $(1, 24.8)$

$29 = ab^0 + 17$
$-17 \quad -17$

$24.8 = ab^1 + 17$
$-17 \quad -17$

$12 = ab^0$

$7.8 = ab$

$a = 12$

$7.8 = 12(b)$

$b = .65$

$y = 12(.65)^t + 17$

$37 = 12(.65)^t + 17$
$-17 \quad -17$

$20 = 12(.65)^t$

$\frac{20}{12} = .65^t$

convert to log form

$t = \log_{.65}\left(\frac{20}{12}\right)$

$t = \frac{\log\left(\frac{20}{12}\right)}{\log(.65)}$

≈ -1.1858 hours
$\times 60$ min/hr

71 minutes before 5:05

SO 3:54 PM time of death

correct Solution to #11

Asymptote $y = 30$ so use $y = ab^x + c$ (Not $y = ab^x$)

$(2, 36.4)$

$y = ab^x + 30$

$(6, 32.62144)$

$y = ab^x + 30$

$36.4 = ab^2 + 30$
$-30 \quad -30$

$32.62144 = ab^6 + 30$
$-30 \quad -30$

$ab^2 = 6.4$

$ab^6 = 2.62144$

Eliminate a by dividing

$$\frac{\cancel{a}b^6}{\cancel{a}b^2} = \frac{2.62144}{6.4}$$

$$b^4 = \frac{2.62144}{6.4}$$

$$\sqrt[4]{} \quad \sqrt[4]{}$$

$b = 0.8$ exactly!

$ab^2 = 6.4$

$a(0.8^2) = 6.4$

$a = \frac{6.4}{.8^2}$

$= 10$

$\therefore \boxed{y = 10(.8)^x + 30}$ a must!