P. 388

51) $a^{-x} = M$

PP. 397-398

4) $\log_4 64 + \log_4 32$

11) 8log y

19) log x – log y

24) $3\log_a x + 2\log_a y + \log_a z$

26) $2\log_b x + \log_b y - 3\log_b b$

29) $\frac{3}{2}\log r + \frac{1}{2}\log t$

39) $\log\left(m^3\sqrt{n}\right)$

46) $\log(x^2 + 2x + 4)$

55) 1.991

Nov 15-2:56 PM

Applications of Logs

Nov 10-11:11 AM

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

P = principal (amount invested)
A = Amount after t years
e = Euler's number

Compounded Continuously: $A = Pe^{rt}$

r = rate as a decimal
t = number of years
n = number of compounds per year

Nov 10-9:00 AM

1. If $5000 is invested at 6.5% annual interest rate, how much will you have after $3\frac{1}{2}$ years if the money is compounded:

a. Annually
$P=5000$, $r=.065$, $t=3.5$
$A=P(1+\frac{r}{n})^{nt}$
$A=5000(1+\frac{.065}{1})^{3.5(1)}$
$6232.95

b. Quarterly
$n=4$, $P=5000$, $r=.065$
$A=5000(1+\frac{.065}{4})^{(3.5)(4)}$
$6265.82

c. Monthly
$n=12$
$A=5000(1+\frac{.065}{12})^{12(3.5)}$
$6273.43

d. Continuously
$A=Pe^{rt}$
$A=5000e^{.065(3.5)}$
$6277.29

Nov 10-9:02 AM

2. How long will it take your $5000 invested at 6.5% to double compounded:

$10,000 (A)$

a. Monthly → $n=12$

b. Continuously

a) $\frac{10,000}{5000} = \frac{5000}{5000}\left(1+\frac{.065}{12}\right)^{12t}$

$2 = \left(1+\frac{.065}{12}\right)^{12t}$

$\log 2 = \log\left(1+\frac{.065}{12}\right)^{12t}$

$\log 2 = 12t \log\left(1+\frac{.065}{12}\right)$

$\frac{\log 2}{12\log(1+\frac{.065}{12})}$

10.69 yrs $= t$
10.7 yrs $= t$

b) $A=Pe^{rt}$

$\frac{10,000}{5000} = \frac{5,000}{5000}e^{.065t}$

$2 = e^{.065t}$

$\ln 2 = \ln e^{.065t}$

$\frac{\ln 2}{.065} = \frac{.065t}{.065}$

$10.66 = t$

10.7 yrs

Nov 28-10:30 AM

3. If you put $5000 in an account that pays interest quarterly, what interest rate must you receive in order to have $7500 after 5 years?

P = 5000, n = 4, r, A = 7500, t = 5

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

$7500 = 5000\left(1+\frac{r}{4}\right)^{4(5)}$

$\frac{7500}{5000} = \frac{5000}{5000}\left(1+\frac{r}{4}\right)^{20}$

$\sqrt[20]{\frac{3}{2}} = \sqrt[20]{\left(1+\frac{r}{4}\right)^{20}}$

$\sqrt[20]{\frac{3}{2}} = 1 + \frac{r}{4}$

$4\left(\sqrt[20]{\frac{3}{2}} - 1\right) = \frac{r}{4}\cdot 4$

$r = \left(4\sqrt[20]{\frac{3}{2}} - 1\right)$

4 × 20 math 5 3/2 − 1

$r = .082$

8.2%

Nov 10-9:03 AM

4. Mike invests $6000 in a retirement account with a fixed annual interest rated compounded continuously. After 15 years, his balance is $8099.15. What is the interest rate on the account?

$A = Pe^{rt}$

$\frac{8099.15}{6000} = \frac{6000e^{r(15)}}{6000}$

$\frac{8099.15}{6000} = e^{15r}$

$\ln\left(\frac{8099.15}{6000}\right) = \ln e^{15r}$

$\frac{\ln\left(\frac{8099.15}{6000}\right)}{15} = \frac{15r\ln e}{15}$

$.0199 = r$

1.99%

≈ 2%

Due Monday 11/19
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The mass of a radioactive element at time t is given by

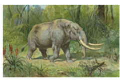
$$A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$$

Where A_0 is the initial mass and h is the half-life of the element.

5. After 43 years, a 20-milligram sample of strontium-90 $({}^{90}Sr)$ decays to 6.071 mg. What is the half-life of strontium-90?

Nov 10-9:03 AM

6. When a living organism dies, its carbon-14 decays. The half-life of carbon-14 is 5730 years. If the skeleton of a mastodon has lost 58% of its original carbon-14, when did the mastodon die? (to the nearest hundred years)



Nov 10-9:03 AM