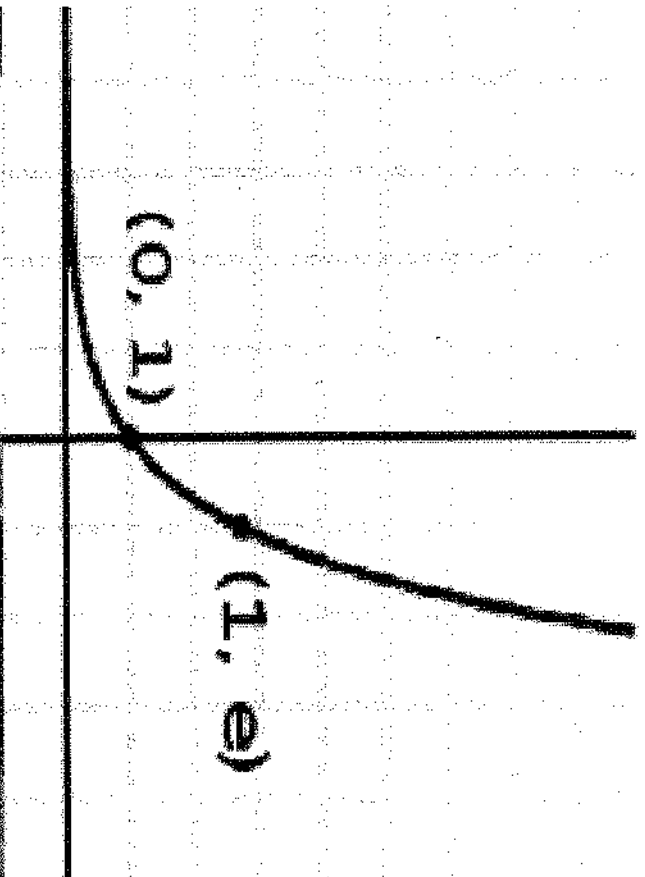


A2: Exponential Word Problems

Notes



Compound Interest

For interest compounded n times per year:

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

Where:

$A =$ Accumulated amount (end)	$P =$ Principal (begin)	$r =$ rate (as a decimal; not percent)	$n =$ # times Compounded	$t =$ time (years)
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	n
Annually	1
Quarterly	4
Monthly	12
Weekly	52
Daily <small>* non-leap year</small>	365
Semiannually	2
<u>Bimonthly</u>	Could be (24) twice a month or every 2 months (6)



★ would need more info.

Compound Interest

For interest compounded continuously:

$$A = Pe^{rt} \quad A = P(e)^{rt}$$

Where:

A = Accumulated amount (end)

P = Principal (begin)

r = rate (as a decimal ; no percent)

t = time (years)

1. (Round to the nearest hundredth) Find the total value of a \$5,000 investment if it is invested for 5 years at 7.2% interest compounded...

a) monthly $A = ?$

$$P = 5000$$

$$\star r = \underbrace{7.2\%}_{\text{rate}} \Rightarrow .072$$

$$n = 12$$

$$t = 5$$

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

(12)(5)

$$A = 5000 \left(1 + \frac{.072}{12} \right)^{60}$$

$$A = 5000 \underbrace{(1.006)}_{\text{do 1st}}^{60}$$

$$\boxed{A \approx \$7158.94}$$

1. (Round to the nearest hundredth) Find the total value of a \$5,000 investment if it is invested for 5 years at 7.2% interest compounded...

b) daily

$$A = ?$$

$$P = 5000$$

$$r = .072$$

$$n = 365$$

$$t = 5$$

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

$$A = 5000 \left(1 + \frac{.072}{365}\right)^{(365 \times 5)}$$

$$A = 5000 (1.00019726)^{1825}$$

do 1st

$$A \approx \$7166.39$$

1. (Round to the nearest hundredth) Find the total value of a \$5,000 investment if it is invested for 5 years at 7.2% interest compounded...

c) continuously

$$A = ?$$

$$P = 5000$$

$$A = P(e)^{rt}$$

$$r = .072$$

$$t = 5$$

$$A = 5000 (e)^{(.072)(5)}$$

$$A = 5000 (e)^{.36}$$

do 1st

$$A \approx \$7166.65$$

2. (Round to the nearest hundredth) How long will it take for a \$5,000 investment to be worth \$12,000 if you invest at 8% compounded...

a) continuously

$$A = P(e)^{rt}$$

$$t = ?$$

$$A = 12,000$$

$$P = 5,000$$

$$r = 8\% = .08$$

$$A = P(e)^{rt}$$

$$\frac{12,000}{5,000} = \frac{5,000(e)^{(.08t)}}{5,000}$$

$$2.4 = (e)^{(.08t)}$$

$$\ln(2.4) = \ln(e)^{(.08t)}$$

$$\ln(2.4) = (.08t) \ln(e)$$

$$\frac{\ln(2.4)}{.08} = \frac{.08t}{.08}$$

Find

$$t \approx 10.94 \text{ years}$$

2. (Round to the nearest hundredth) How long will it take for a \$5,000 investment to be worth \$12,000 if you invest at 8% compounded...

$$t = ?$$

b) semi-annually

$$A = 12,000$$

$$P = 5,000$$

$$n = 2$$

$$r = .08$$

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

$$12000 = 5000 \left(1 + \frac{.08}{2} \right)^{2t}$$

$2t \leftarrow \text{Find}$

$$\frac{12000}{5000} = \frac{5000}{5000} (1.04)^{2t}$$

$$2.4 = (1.04)^{2t}$$

$$\log(2.4) = \log(1.04)^{2t}$$

$$\frac{\log(2.4)}{2 \log(1.04)}$$

$$= \frac{2t \log(1.04)}{2 \log(1.04)}$$

$$t = \frac{\log(2.4)}{2 \log(1.04)}$$

$$t \approx 11.16 \text{ yrs}$$