DATE: _____

3.6 Mathematics of Finance *(Target 3G)*

1. A man invests $10, 000 in an account that pays 8.5% interest per year, compounded quarterly. What is the amount of money that he will have after 3 years?

$A = P(1+\frac{r}{k})^{kt}$

$A = 10000(1+\frac{.085}{4})^{4(3)}$

$A = 12870.186 \rightarrow \boxed{\$12870.19}$

$P = 10000$
$r = .085$
$k = 4$ (quarterly)
$t = 3$
$A = ?$

2. A sum of $5000 is invested at an interest rate of 9% per year. Find the time required for the money to double ($\rightarrow 10000$) if the interest is compounded:

(a) Semi-annually $\rightarrow k = 2$

$10000 = 5000(1+\frac{.09}{2})^{2t}$

$2 = (1.045)^{2t}$

$\ln 2 = \ln(1.045)^{2t}$

$\ln 2 = 2t \ln(1.045)$

$\frac{\ln 2}{2\ln 1.045} = t$

$\boxed{7.874_{yrs} = t}$

$P = 5000$ $r = 0.09$
$A = 10000$ $t = ?$

(b) Quarterly $\rightarrow k = 4$

$10000 = 5000(1+\frac{.09}{4})^{4t}$

$2 = (1.0225)^{4t}$

$\ln 2 = 4t \ln(1.0225)$

$\frac{\ln 2}{4\ln(1.0225)} = t$

$\boxed{7.788_{yrs} = t}$

(c) Continuously

$A = Pe^{rt}$

$10000 = 5000e^{.09t}$

$2 = e^{.09t}$

$\ln 2 = \ln e^{.09t}$

$\ln 2 = .09t \rightarrow t = \frac{\ln 2}{.09} = \boxed{7.702 \text{ yrs}}$

3. How long will it take for $8000 compounded monthly at 4% to grow to $10000?

$A = P(1+\frac{r}{k})^{kt}$

$10000 = 8000(1+\frac{.04}{12})^{12t}$

$\frac{10000}{8000} = (1.0033)^{12t}$

$\ln(5/4) = 12t \ln(1.0033)$

$\boxed{t = 5.588 \text{ years}}$

$A = 10000$
$P = 8000$
$k = 12$ (monthly)
$r = .04$
$t = ?$

4. How much money should you save in an account paying 5% interest compounded monthly if you want to have $6000 in 6 months?

$A = P(1+\frac{r}{k})^{kt}$

$6000 = P(1+\frac{.05}{12})^{12(.5)}$

$\frac{6000}{(1+\frac{.05}{12})^{6}} = P$

$5852.163 = P \quad \boxed{\$5852.16}$

$A = 6000$
$r = .05$
$k = 12$
$t = .5$ ($\frac{1}{2}$ a year)
$P = ?$

5. A necklace is appraised at $6300. If the value of the necklace has increased at an annual rate of 7%, how much was it worth 15 years ago?

$A = P(1+r)^{t}$

$A = 6300(1+.07)^{-15}$

$A = 2283.410$

$\boxed{\$2283.41}$

$P = 6300$
$r = .07$
$t = -15$
$A = ?$

OR

$A = 6300$
$r = .07$
$t = 15$
$P = ?$

$A = P(1+r)^{t}$

$6300 = P(1+.07)^{15}$

$\frac{6300}{(1.07)^{15}} = P$

$\boxed{\$2283.41} = P$