Closing Thursday:	6.1, 6.2
Closing Tuesday:	6.3, 6.4
Closing Next Thursday:	6.5

6.2 Compound Interest

We say interest is **compounding** if it is computed on the entire balance (principal and previous interest). And we have

$$F = P(1+i)^n = P\left(1+\frac{r}{m}\right)^{mt}$$

Unless otherwise stated, assume interest is compounded.

(If you are doing 6.1 homework or if it say "simple interest", then it is simple interest. *All other times* assume interest is compounding).

Bank terminology:
"6% per year" means *compounding* once a year (r=0.06, m=1)

"6% rate, compounded semiannually" means "6/2 = 3%, twice a year" (r=0.06, *m=2*)

"8% rate, compounded quarterly" means "8/4 = 2%, 4 times a year" (r=0.08,*m=4*)

"5% rate, compounded monthly" means "5/12 = 0.4166…%, 12 times a year" (r=0.05,*m=12*)

Quick Examples:

(a) Harry invests $5000 in an account earning 5% per year. What is the balance in 20 years?

(b) Ron invests $5000 in an account earning 5% annually, compounded quarterly. What is the balance in 20 years?

Continuous Compounding

Assume you invest \$5000 and r = 0.03.

$$F = 5000\left(1 + \frac{0.03}{m}\right)^{m\,t}$$

	m	Balance **one** yr.
semi-annual	2	\$5151.12500
quarterly	4	\$5151.69595
monthly	12	\$5152.07979
Daily	365	\$5152.26632
Hourly	87605	\$5152.27241
every minute	525600	\$5152.27267
every second	3153600	\$5152.27267

The value this is approaching is called the value from **continuous compounding**. And it is also given by

$$F = Pe^{rt}$$

$$F = 5000e^{0.03(1)} \approx \$5152.27267$$

Quick Examples:

(a) How much must you invest at 8%, compounded monthly in order to have $10,000 in 5 years?

(b) You invest $500 in an account earning 3%, compounded quarterly. How long until you have $5000?

(c) You invest $75 in an account where interest is computed semi-annually. After 7 years, the balance is $210. What is the nominal rate, r?

(d) You place 1000 into an account that pays 4%, compounded continuously. How long does it take to double your money?

***Summary*:**

For ALL problems in chapter 6:

1. Identify the type of account.
2. Input given facts.
3. Solve for the unknown.

Algebra Notes:

$$F = P(1+i)^n = P\left(1+\frac{r}{m}\right)^{mt}$$

To solve for *P*, you just divide.
To solve for *r*, a root will be needed.
To solve for *t*, a ln( ) will be needed.

$$F = Pe^{rt}$$

To solve for *P*, you just divide.
To solve for *r*, a ln( ) will be needed.
To solve for *t*, a ln( ) will be needed.

Question:
Which is best?

A: 4%, compounded semi-annually

B: 3.97%, compounded monthly

C: 3.955%, compounded continuously

Compute the APY for each & compare!

Annual Percentage Yield (APY) is the actual percentage change in ***one year***.

We get this by plugging in *t = 1* and look at the amount we are multiplying by as a percentage increase:

$$APY = \left[\left(1 + \frac{r}{m}\right)^{m(1)} - 1\right] \cdot 100\ \%$$

$$APY = \left[e^{r(1)} - 1\right] \cdot 100\ \%$$