1.5.9 Suppose that the T-Bill's face amount is \$100. Then Smith purchases the bill for $100\left[1-\frac{182}{360}(.10)\right] = 94.94$ (nearest .01). 91 days later, the value of the T-Bill is

$100\left[1-\frac{91}{360}(.10)\right] = 97.47.$

Smith's return for the 91 days is $\frac{97.47}{94.94}-1 = .0266$ (2.66%).

1.5.10 From Exercise 1.5.3, we have $\frac{d^{(m)}}{m} = d_j$, and $\frac{i^{(m)}}{m} = j$, so

(a) $\frac{d^{(m)}}{m} = d_j = \frac{j}{1+j} = \frac{\frac{i^{(m)}}{m}}{1+\frac{i^{(m)}}{m}} \rightarrow d^{(m)} = \frac{i^{(m)}}{1+\frac{i^{(m)}}{m}}$, and

(b) $i^{(m)} = \frac{d^{(m)}}{1-\frac{d^{(m)}}{m}}$.

1.5.11 $1000 = 1200\left(\frac{1}{1+i}\right)(1-i) \rightarrow i = .0909$

1.5.12 $1000(1+j) = 1000+40(1+j)^2 \rightarrow (1+j)^2-25(1+j)+25 = 0$ $\rightarrow 1+j = 1.043561$ or 23.9564. Since $j<.10$, it follows that $j=.0436$.

SECTION 1.6

1.6.1 Accumulated value at time 1 is

$10{,}000 \times e^{\int_0^1 .05\,dt} = 10{,}000\times e^{.05} = 10{,}512.71.$

Accumulated value at time 2 is

$10{,}000\times e^{\int_0^1 .05\,dt+\int_1^2[.05+.02(t-1)]\,dt} = 10{,}000\times e^{.05+.06} = 11{,}162.78$

1.6.2 $\left(1+\frac{i^{(4)}}{4}\right)^{16} = e^{\int_0^3 .02t\,dt+\int_3^4 .045\,dt} = e^{.09+.045} \rightarrow i^{(4)} = .0339.$

1.6.3 $\exp\left(\int_0^5 \frac{t^2}{k}\,dt\right) = (1-.04)^{-10} \rightarrow e^{125/3k} = 1.50414$
$\rightarrow \frac{125}{3k} = \ln(1.50414) \quad \rightarrow k = 102.$

1.6.4 Effective annual rate for Tawny is $i=(1.05)^2-1 = .1025$. Tawny: $\delta = \ln(1.1025) = .09758$.

Fabio: Simple interest rate $j \rightarrow \delta_t = \frac{j}{1+tj}$.

At time 5,
$.09758 = \frac{j}{1+5j} \rightarrow j=.1906 \rightarrow Z=1000[1+5j]=1953.$

1.6.5 $100\left[e^{\int_0^6 .01t^2\,dt}-e^{\int_0^3 .01t^2\,dt}\right]+X\left[e^{\int_3^6 .01t^2\,dt}-1\right] = X$
$\rightarrow 100(e^{.72}-e^{.09}) = X(2-e^{.63}) \rightarrow X = 784.6.$

1.6.6 Bruce's 6-month rate of interest is $\frac{i}{2}$, and 7.25 years is 14.5 6-month periods. Bruce's accumulated value after 7.25 years is $100\left(1+\frac{i}{2}\right)^{14.5} = 200$. Solving for i, we get

$$\left(1+\frac{i}{2}\right) = 2^{1/14.5} \rightarrow i = .0979.$$

Peter's account grows to $100e^{7.25\delta} = 200$, so that $\delta = \frac{1}{7.25}\ln 2 = .0956$. Then $i-\delta = .0023 = .23\%$.

1.6.7 $e^{\delta}\cdot(e^{1.5\delta})^4 = 1.36086 \rightarrow e^{7\delta} = 1.36086 \rightarrow 1+i = e^{\delta} = 1.045$