1.2.6 $480 = 50+100(v+v^2+v^3+v^4)+Xv^5$, where $v=\frac{1}{1.03}$, so that $X=67.57$. If interest is .01 per month, then $v = \frac{1}{(1.01)^3}$ and $X=67.98$.

1.2.7 $100+200v^n+300v^{2n} = 600v^{10} \rightarrow$

$600v^{10} = 100+200(.75941)+300(.75941)^2$

$\rightarrow v^{10} = .708155 \rightarrow i = (.708155)^{-.1}-1 = .0351.$

1.2.8 (a) $(20)(2000)[v+v^2+v^3+\cdots+v^{48}] = 1{,}607{,}391$ (at .75%)

(b) $1{,}607{,}391+200{,}000v^{48} = 1{,}747{,}114$

(c) $X = 1{,}607{,}391+.15Xv^{48} \rightarrow X = 1{,}795{,}551$

1.2.9 $750 = 367.85[1+(1+j)] \rightarrow j = .0389$ is the 2-month rate.

1.2.10 With X initially stocked, the number after 4 years is

$X(1.4)^4-5000\left[(1.4)^{1.5}+(1.4)^{.5}\right] = X \rightarrow X = 4997.$

1.2.11 $1000 = \frac{100}{(1+j)^2}+\frac{1000}{(1+j)^3}$, and $1000 = \frac{100}{1+k}+\frac{1000}{(1+k)^3}$. It is not possible that $j=k$, since the two present values could not both be equal to 1000 (unless $j=k=0$, which is not true). If $j>k$, then $(1+j)^2>1+k$ and $(1+j)^3>(1+k)^3$, in which case the first present value would have to be less than the second present value. Since both present values are 1000, it must be the case that $j<k$ ($j=.0333$ and $k=.0345$).

1.2.12 $1000(1+i)^2+1092 = 2000(1+i)$

Solving the quadratic equation for $1+i$ results in no real roots.

1.2.13 (a) $\frac{d}{di}(1+i)^n = n(1+i)^{n-1}$ (c) $\frac{d}{dn}(1+i)^n = (1+i)^n\ln(1+i)$

(b) $\frac{d}{di}v^n = -nv^{n+1}$ (d) $\frac{d}{dn}v^n = -v^n\ln(1+i)$

1.2.14 With an annual yield rate quoted to the nearest .01%, the annual yield i is in the interval $.11065 \le i < .11075$.

Since the quoted annual yield rate is $\frac{365}{182}\cdot\frac{100-\text{Price}}{\text{Price}}$ it follows that $.11065 \le \frac{365}{182}\cdot\frac{100-\text{Price}}{\text{Price}} < .11075$, or, equivalently, $94.767 \le \text{Price} < 94.771$.

1.2.15 (a) $P = \frac{1000{,}000}{1+(.10)\frac{182}{365}} = 95{,}250.52$

(b) $P = \frac{100{,}000}{1+i\cdot\frac{182}{365}} \rightarrow \frac{dP}{di} = -\frac{100{,}000}{\left(1+i\cdot\frac{182}{365}\right)^2}\cdot\frac{182}{365}$

$= -45{,}239.03$ if $i = .10$

$\frac{dP}{di} \doteq \frac{\Delta P}{\Delta i} \doteq -45{,}239.03 \rightarrow \Delta P \doteq -45.239.03\cdot\Delta i.$

If $\Delta i = .001$, then $\Delta P \doteq -45.24$.

(c) $P=\frac{100{,}000}{1+i\cdot\frac{91}{365}} \rightarrow \frac{dP}{di}=-\frac{100{,}000}{\left(1+i\cdot\frac{91}{365}\right)^2}\cdot\frac{91}{365}=-23{,}733.34$ if $i=.10$.

As the T-bill approaches its due date the $\frac{dP}{di}$ goes to 0.