1. The equal payment amount $A$ for a loan of size $B$ is calculated by setting $A = B(A/P, i_b, N)$. Substituting the values given in the problem,

$$A = 100,000(A/P, 0.5\%, 360) = $599.55.$$

2. We write the loan balance for each year starting from year 1,

$$B_1 = B$$
$$B_2 = B(1 + i_b) - A$$
$$B_3 = (B(1 + i_b) - A)(1 + i_b) - A$$
$$= B(1 + i_b)^2 - A\{(1 + i_b) + 1\}$$
$$\vdots$$
$$B_n = B(1 + i_b)^{n-1} - A\{(1 + i_b)^{n-2} + (1 + i_b)^{n-1} + \ldots + 1\}$$
$$= B(1 + i_b)^{n-1} - A\left\{\frac{(1 + i_b)^{n-1} - 1}{i_b}\right\}$$
$$= B(F/P, i_b, n - 1) - A(F/A, i_b, n - 1).$$

Then we have

$$B_{17} = 100,000(F/P, 0.5\%, 16) - 599.55(F/A, 0.5\%, 16) = $98,346.05,$$

and

$$D_{32} = A - i_bB_{32}$$
$$= 599.55 - (0.005)\{100,000(F/P, 0.5\%, 31) - 599.55(F/A, 0.5\%, 31)\}$$
$$= $116.19.$$

3. We can write $I_n = i_bB_n$ as

$$I_n = i_b\left\{B(1 + i_b)^{n-1} - A\left\{\frac{(1 + i_b)^{n-1} - 1}{i_b}\right\}\right\}$$
$$= (i_bB - A)(1 + i_b)^{n-1} + A.$$
The present value of \( \{I_n\} \) at interest rate \( i \) becomes

\[
PV(i) = \sum_{n=1}^{n=N} I_n(1+i)^{-n} \\
= \sum_{n=1}^{n=N} \left( \frac{ib - A}{1+ib} \right) \frac{(1+ib)^{n-1}}{(1+i)^n} + \frac{A}{1+i} \sum_{n=1}^{n=N} \frac{1}{(1+i)^n} \\
= \left( \frac{ib - A}{1+ib} \right) \sum_{n=1}^{n=N} \frac{(1+ib)^{n}}{(1+i)^n} + A \sum_{n=1}^{n=N} \frac{1}{(1+i)^n}.
\]

Now let \( (1+g) = \frac{(1+i)}{(1+ib)} \).

Then,

\[
PV(i) = \left( \frac{ib - A}{1+ib} \right) \sum_{n=1}^{n=N} \frac{1}{(1+g)^n} + A \sum_{n=1}^{n=N} \frac{1}{(1+i)^n} \\
= \left( \frac{ib - A}{1+ib} \right) (P/A, g, N) + A(P/A, i, N).
\]

(a) When \( i = 1\% \) and \( ib = 0.5\%, \ g = 0.495\%. \) Then,

\[
PV(1\%) = \left( \frac{(0.005)(100,000) - 599.55}{1 + 0.005} \right) (P/A, 0.495\%, 360) + 599.55(P/A, 1\%, 360) \\
= $41,712.74.
\]

(b) When \( i = ib = 0.5\%, \ g = 0.\) Then,

\[
PV(1\%) = 360 \left( \frac{(0.005)(100,000) - 599.55}{1 + 0.005} \right) + 599.55(P/A, 0.5\%, 360) \\
= $64,340.12.
\]

4. (a) 10,000 = 460 (P/A, i, 30). Solving for \( i \) gives \( i = 2.22\%. \)

(b) \( i_a = (1 + 0.0222)^{12} - 1 = 30.12\%. \)

(c) 460 + 460 (P/A, 2.22, 14) = $5944.34.

5. The heating oil price in a year from now is $1.10. The total amount required to buy 1000 gallons is $1100 during the first year. Hence,

\[
P = 1100(P/A, 10, 6, 10) \\
= 1100 \frac{1 - (1 + 0.1)^{10}(1 + 0.06)^{-10}}{0.06 - 0.1} \\
= 12,329.13
\]