

1. **(3 points)** You pay \$2.34 for a gallon of milk, including a 4% sales tax. What was the price of the milk prior to applying tax?

\$2.34 represents 104% of the list price of the milk, since the sales tax results in a 4% increase in the price. Thus, the list price is

$$\frac{\$2.34}{1.04} = \$2.25.$$

2. **(4 points)** Kim has borrowed \$2000 under the conditions that she will pay back \$3000 in four years. What is the annual simple interest rate which is described by these terms on the loan?

This loan has a present value of $P = \$2000$ and a future value of $F = \$3000$, accruing over a course of $t = 4$ years. We wish to calculate the interest rate, described by the relationship

$$r = \frac{F - P}{Pt} = \frac{3000 - 2000}{2000 \times 4} = 0.125 = 12.5\%$$

3. **(3 points)** I invest \$700 into government bonds which earn 3% interest per year compounded annually. How much will my investment be worth in ten years?

The present value of my investment is $P = \$700$, with annual interest rate $r = 3\%$ and lifetime of $t = 10$ years, so our future value is

$$P(1 + r)^t = \$700 \times (1.03)^{10} \approx \$940.74$$

4. **(5 points)** Xavier takes out a \$950 loan with an annual interest rate of 7% compounded semiannually (twice a year). If he repays the loan in full three years later, how much interest will he have paid?

The present value on his loan is $P = \$950$, with annual interest rate $r = 7\%$, lifetime of $t = 3$ years, and compounding $n = 2$ times per year; the future value is thus

$$P \left(1 + \frac{r}{n}\right)^{tn} = \$950 \times \left(1 + \frac{0.07}{2}\right)^{3 \times 2} = \$950 \times (1.035)^6 \approx \$1167.79$$

Note however, that the question asked how much interest is charged; this figure of \$1167.79 includes both interest and principal, so we subtract the principal of \$950 to get \$217.79 charged in interest.