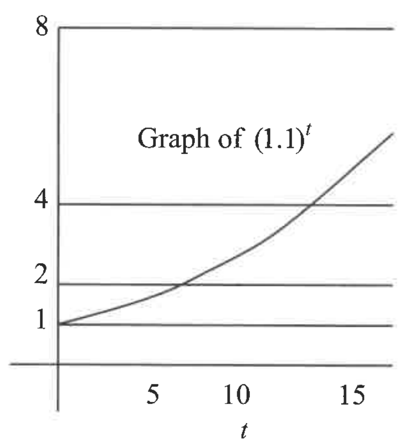
1.1.13 We use the following result from calculus: if f and g are differentiable functions such that $f(a)=g(a)$ and $f'(x)<g'(x)$ for $a<x<b$, then $f(b)<g(b)$.

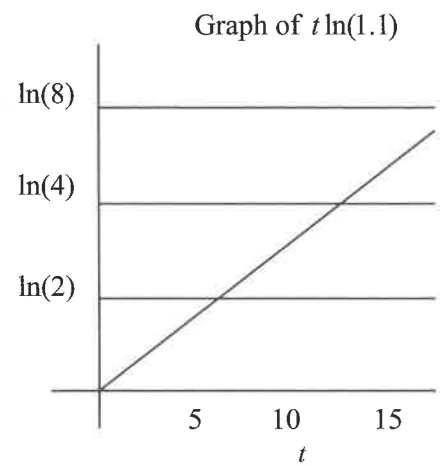
(i) Suppose $0<t<1$. Let $f(i)=(1+i)^t$ and $g(i) = 1+i\cdot t$. Then $f(0)=g(0)=1$. If we can show that $f'(i)<g'(i)$ for any $i>0$, then we can use the calculus result above to conclude that $f(i)<g(i)$ for any $i>0$. First note that $f'(i) = t\cdot(1+i)^{t-1}$ and $g'(i)=t$. Since $i>0$, it follows that $1+i>1$, and since $t<1$, it follows that $t-1 < 0$. Then $(1+i)^{t-1}<1$, so $f'(i) < g'(i)$.

This completes the proof of part (i).

(ii) Suppose that $t>1$. Let $f(i) = 1+i\cdot t$ and $g(i)=(1+i)^t$. Again $f(0)=g(0)$. If we can show that $f'(i)<g'(i)$ for any $i>0$, then we can use the calculus result above to conclude that $f(i)<g(i)$ for any $i>0$. Since $t>1$ and $i>0$ it follows that $t-1 > 0$ and $1+i>1$. Thus $(1+i)^{t-1}>1$, and it follows that $f'(i) = t < t\cdot(1+i)^{t-1} = g'(i)$. This completes the proof of part (ii).

1.1.14 Original graph is $y=(1+i)^t$. New graph is $10^y=(1+i)^t$, or, equivalently, $y=t\cdot\frac{\ln(1+i)}{\ln(10)}$, so that y is now a linear function of t.





SECTIONS 1.2 AND 1.3

1.2.1 Present value is

$$5000\left[\frac{1}{1.06}+\frac{1}{(1.06)^2}+\frac{1}{(1.06)^3}+\frac{1}{(1.06)^4}\right] = 17{,}325.53.$$

1.2.2 Amount now required is

$$25{,}000[v^{17}+v^{15}+v^{12}]+100{,}000[v^{20}+v^{18}+v^{15}] = 75{,}686$$

1.2.3 $28 = 15+16.50v \rightarrow v = .78779 \rightarrow i = .2692$

1.2.4 $1000\cdot v_{.06}^3\cdot v_{.07}^4\cdot v_{.09}^3 = 494.62$

1.2.5 Equation of value on July 1, 2013 is

$$200(1.04)+300v = 100(1.04)^4 + X \rightarrow X = 379.48.$$