# Solutions To Project 3

**(1)**

$$25{,}000 = 1000(1.25)^T$$
$$25 = 1.25^T$$
$$\ln(25) = T\ln(1.25)$$
$$3.219 = T(.223)$$
$$T = 14.435$$

**(2)**

$$\sqrt[4]{X^3} = 16$$
$$X^3 = 16^4$$
$$X^3 = 65{,}536$$
$$X = 40.317$$

**(3)**

$$8000 = 10000(1+R)^{5.7}$$
$$.8 = (1+R)^{5.7}$$
$$(.8)^{1/5.7} = (1+R)$$
$$.9616 = 1+R$$
$$R = -.0384$$

**(4)**

$$A = P\left[\frac{(1+R)^n - 1}{R}\right]; n$$
$$\frac{AR}{P} = (1+R)^n - 1$$
$$\frac{AR}{P} + 1 = (1+R)^n$$
$$\ln\left(\frac{AR}{P} + 1\right) = n\ln(1+R)$$
$$n = \frac{\ln\left(\frac{AR}{P} + 1\right)}{\ln(1+R)}$$

**(5)**

$$\sqrt{1+X} = 8$$
$$1+X = 64$$
$$X = 63$$

**(6)**

$$2^{(x^2-7x+8)}=100$$
$$(x^2-7x+8)\ln(2)=\ln(100)$$
$$x^2-7x+8=6.644$$
$$x^2-7x+1.356=0$$
$$\frac{-(-7)\pm\sqrt{49-4(1)(1.356)}}{2}$$
$$\frac{7\pm\sqrt{43.576}}{2}$$
$$x=6.8$$
$$or$$
$$x=.1994$$

**(7)**

$$10{,}000(1.2)^T=25{,}000(1.1)^T$$
$$T\ln(1.2)=\ln(2.5)+T\ln(1.1)$$
$$.1823T=.9163+.09531T$$
$$.08699T=.9163$$
$$T=10.533$$

**(8)**

$$\log(X^2)-\log(X)=4$$
$$\log\left(\frac{X^2}{X}\right)=4$$
$$10^{\log(X)}=10^4$$
$$X=10^4=10{,}000$$

**(9)**

$$24{,}000e^{.05(T-3)}=15000(1.08)^T$$
$$e^{.05(T-3)}=.625(1.08)^T$$
$$.05T-.15=\ln(.625)+T\ln(1.08)$$
$$.05T-.15=-.47+.077T$$
$$.027T=.32$$
$$T=11.85$$

**(10)**

$$F = Se^{(R-Y)T};Y$$

$$\frac{F}{S} = e^{(R-Y)T}$$

$$\ln\left(\frac{F}{S}\right) = (R-Y)T$$

$$\frac{\ln\left(\frac{F}{S}\right)}{T} = R-Y$$

$$Y = R - \frac{\ln\left(\frac{F}{S}\right)}{T}$$

**(11)**

$$P = \frac{100}{(1+R)^n};R$$

$$P(1+R)^n = 100$$

$$(1+R)^n = \frac{100}{P}$$

$$1+R = \left(\frac{100}{P}\right)^{\frac{1}{n}}$$

$$R = \left(\frac{100}{P}\right)^{\frac{1}{n}} - 1$$

**(12)**

$$.5X^6 - 1000 = 0$$

$$.5X^6 = 1000$$

$$X^6 = 2000$$

$$X = 3.5496$$

**(13)**

$$1000e^{.1t} = -20{,}000$$

$$\ln\left(e^{.1t}\right) = (-20)\ln$$

No Answer!

**(14)**

$$5^{(\sqrt{x}+1)} = 1000$$
$$(\sqrt{x}+1)\ln(5) = \ln(1000)$$
$$\sqrt{x}+1 = 4.292$$
$$\sqrt{x} = 3.292$$
$$x = 10.837$$

**(15)**

$$\ln(X-3) = 2 - \ln(X-4)$$
$$\ln(X-3) + \ln(X-4) = 2$$
$$\ln((X-3)(X-4)) = 2$$
$$X^2 - 7X + 12 = e^2$$
$$X^2 - 7X + 4.611 = 0$$
$$\frac{-(-7) \pm \sqrt{49 - 4(1)(4.611)}}{2}$$
$$\frac{7 \pm \sqrt{30.556}}{2}$$
$$X = 6.264$$
*or*
$$X = .7361$$

**(16a)**

$$\left(9a^{2/5}b^{-4}\right)^{-1/2}$$
$$3a^{-1/5}b^2 = \frac{3b^2}{a^{1/5}}$$

**(16b)**

$$\sqrt[5]{100.00} = 2.5119$$

**(16c)**

$$\left(-64a^{-12}\right)^{1/3}$$
$$-4a^{-4} = \frac{-4}{a^4}$$

**(16d)**

$$1000e^{-.2} = 818.731$$

**(16e)**

$$a\sqrt{a} = a^1 a^{1/2} = a^{3/2}$$

**(16f)**

$$\left(2\times 10^3\right)^3 = (2000)^3$$
$$= 8\times 10^9$$

**(17)**

Betty:

$$4000(1+R)^{27/12} = 5{,}478.10$$
$$(1+R)^{2.25} = 1.369525$$
$$1+R = 1.1499998$$
$$R = 15\%$$

Bob:

$$16{,}000(1+R)^{44/12} = 25{,}868.49$$
$$(1+R)^{44/12} = 1.616781$$
$$1+R = 1.1399999$$
$$R = 14\%$$

So, Betty did better!

**(18a)**

$$2P = A = Pe^{rt}$$
$$2 = e^{rt}$$
$$\ln(2) = rt$$
$$\frac{\ln(2)}{r} = t$$

**(18b)**

$$5000e^{6.93\% .40} = \$79{,}952.92$$

**(19a)**

$$25000(1+.20)^T = 12{,}500(1+.40)^T$$
$$2(1.2)^T = (1.4)^T$$
$$\ln(2) + T\ln(1.2) = T\ln(1.4)$$
$$.6931 + .18232T = .33647T$$
$$.6931 = .15415T$$
$$T = 4.4963$$

**(19b)**

$$2(1+R)^T = (1+2R)^T$$
$$\ln(2) + T\ln(1+R) = T\ln(1+2R)$$
$$\ln(2) = [\ln(1+2R) - \ln(1+R)]T$$
$$T = \frac{\ln(2)}{\ln\left(\frac{1+2R}{1+R}\right)}$$

**(20a)**

Yes. Good for all r’s.

**(20b)**

No! $\log\left(\frac{A}{B}\right) = \log\left(\frac{C}{D}\right)$

**(20c)**

$$\frac{e^{X^2}}{e^X} = e^{X^2} e^{-X} = e^{(X^2 - X)}$$

**(20d)**

$$S = V^{2/3} \times 6$$

**(20e)**

$$\log\left(\sqrt[n]{a}\right) = \log\left(a^{1/n}\right) = \frac{1}{n}\log(a)$$