Math 111 Final exam, Winter 2007, version 2

Hints and answers

1.
a) Use CAF: $2{,}414{,}616(1+0.021)^{30}$. Answer: 4,504,227 residents
b) CAF for depreciation (like in the activity): $30{,}000(1-0.19)^{6.5} \approx \$\ 7{,}625.60$
c) CAF: $11{,}000=P(1+0.1)^{(20/12)}$. Solve for P. $P \approx \$9{,}384.36$
d) Multiplicative Sequence: $300*3^{(9/4)}$. Answer: 3,553 bacteria

2.
a) $(m-1)x100\%=(e^{(0.08)(1)}-1)x100 \approx 8.33\%$
b) Solve for r: $3P=P(1+r/4)^{(4x10)}$. r=0.111383…. Answer: ≈ 11.14%
c) Solve for t: $2P=Pe^{0.08t}$. $t=\ln 2/0.08 \approx 8.66$ years.
d)$B(0.5)=B(0)e^{(0.08x0.5)}$, so the multiplier for each 0.5 years is $e^{(0.08x0.5)}=1.040810774$.
%change=(m-1)x100 ≈ 4.08%

3.
Use the tests for additive and multiplicative sequences. You should get:
A is additive with increment 1.1 and A(100)=2+100x1.1=112
B is neither
C is multiplicative with multiplier 1.1 so $C(100)=2(1.1)^{100}=27{,}561.22468$

4.
a) Look for vertical distance between TR and TC, with TR above, to be \$500 (= 1tickmark.)
Accepted range of answers: q=6.5-6.9, or q=9.3-9.6
b) Draw a reference line of slope \$4 per Wiggle (diagonal thru (10 hundred wiggles, \$4000))
Move ruler parallel to reference line until tangent to graph of TC, at about q=10 or q=1.9.
c) AVC(5)=VC(5)/500=[TC(5)-FC]/500=[2500-1000]/500=3
d) i) draw a digonal line through the point (10, 3000)
ii) If you shut down you lose your fixed costs (\$1000), but if you produce around 9 hundred wiggles you lose less, only about \$500. The marketprice of \$3 is below the Breakeven price (you never even break even) but above the Shutdown price (you should still produce some).

5.
a) about 118 to 246 T-Shirts (accepted 115-120 to 242-248).
b) MC(100)=3
c) MR=MC, transitioning from MR>MC to MR<MC: at about q=260 (range:255-263).
d) y-coordinate of point where MC=AVC: about \$4 per shirt (range: 4-4.2).

6.
a)vertex at q=2.5, A(2.5)=17.5 gallons
b) $-2t^2+10t+5=6$ has roots at t≈ 0.1…, and t≈ 4.9. Sketch the graph: graph is above 6 between the roots.
c) $\dfrac{A(2.5)-A(1)}{2.5-1}=\dfrac{17.5-13}{1.5}=3$ gallons per hour
d) iv

7.
a) s(60) ≈60.17
b) D(t)=60t+10
c) 0.83 seconds
d) 18.84 seconds