Exam 2a, Fall 2004

Notes on Solution

Part 1

Utility Function:	U = X^a * Y^(1-a)
Parameter a:	0.2
Demand for X:	X = (0.2*M)/Px
Demand for Y:	Y = (0.8*M)/Py
Expenditure Funct:	M = U * (Px/0.2)^0.2 * (Py/0.8)^0.8

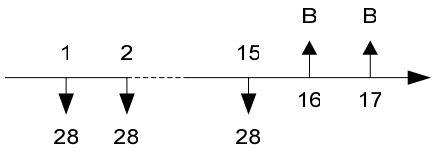
Question 1

M	2000
Px	2
Py	5
X	200
Y	320
U	291.2903

Question 1b

Px	4
Py	5
X	100
Y	320
M3	M = 291.290 * (4/0.2)^0.2 * (5/0.8)^0.8
M3	2297
CV	297
Revenue:	200

Question 2a



Years:	15	
Annual cost:	28	420
Interest rate:	5%	

PV at 0 of 28 million per year forever:	560
PV at 15 of 28 million per year, years 16+	560
PV at 0 of 28 million per year, years 16+	269
PV cost of payments 1-15:	291

Question 2b

B	20	million
PV at 15 of benefits, years 16+		400
PV at 0 of benefits, years 16+		192
NPV = PV(B) - PV(C)		-98

Does not make sense to clean up the lake; could deliver the benefits at a lower cost.

PV at 15 of benefits, years 16+	B/r
PV at 0 of benefits, years 16+	(B/r)/(1+r)^15

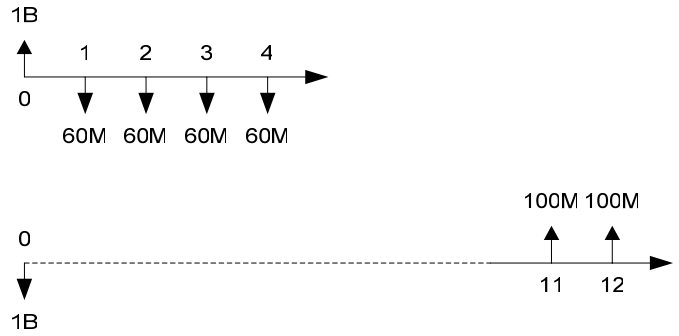
Benefits must be at least large enough to make the following hold:
$(B/r)/(1+r)^{15} \geq 291$
$B \geq r * (1+r)^{15} * 291$
B ≥ 30.20999 million

Check:

B/r	604
PV of B/r	291

Question 3a

The diagram below shows the two cash flows associated with the project. The top flow is for the bond used to finance the project: it generates $1B immediately but then obligates the city to raise $50M in interest per year. Since the CV of a $1 tax is $1.20, raising $50M costs the city's citizens $60M in CV. Hence, the overall cost of each interest payment is really $60M.



Construction cost at 0:	1000	million
Annual benefits when complete:	100	million
Year benefits begin:	11	
Interest rate:	5%	
PV of bond:		
CV per year:	60	
PV of payments forever:	1200	
Revenue raised at 0:	1000	
Net value (revenue-costs):	-200	
PV of road:		
PV(B) at 10	2000	
PV(B) at 0	1228	
Cost at 0:	1000	
Net value (benefit-cost):	228	
Overall:		
PV of bond:	-200	
PV of road:	228	
Net PV overall:	28	