

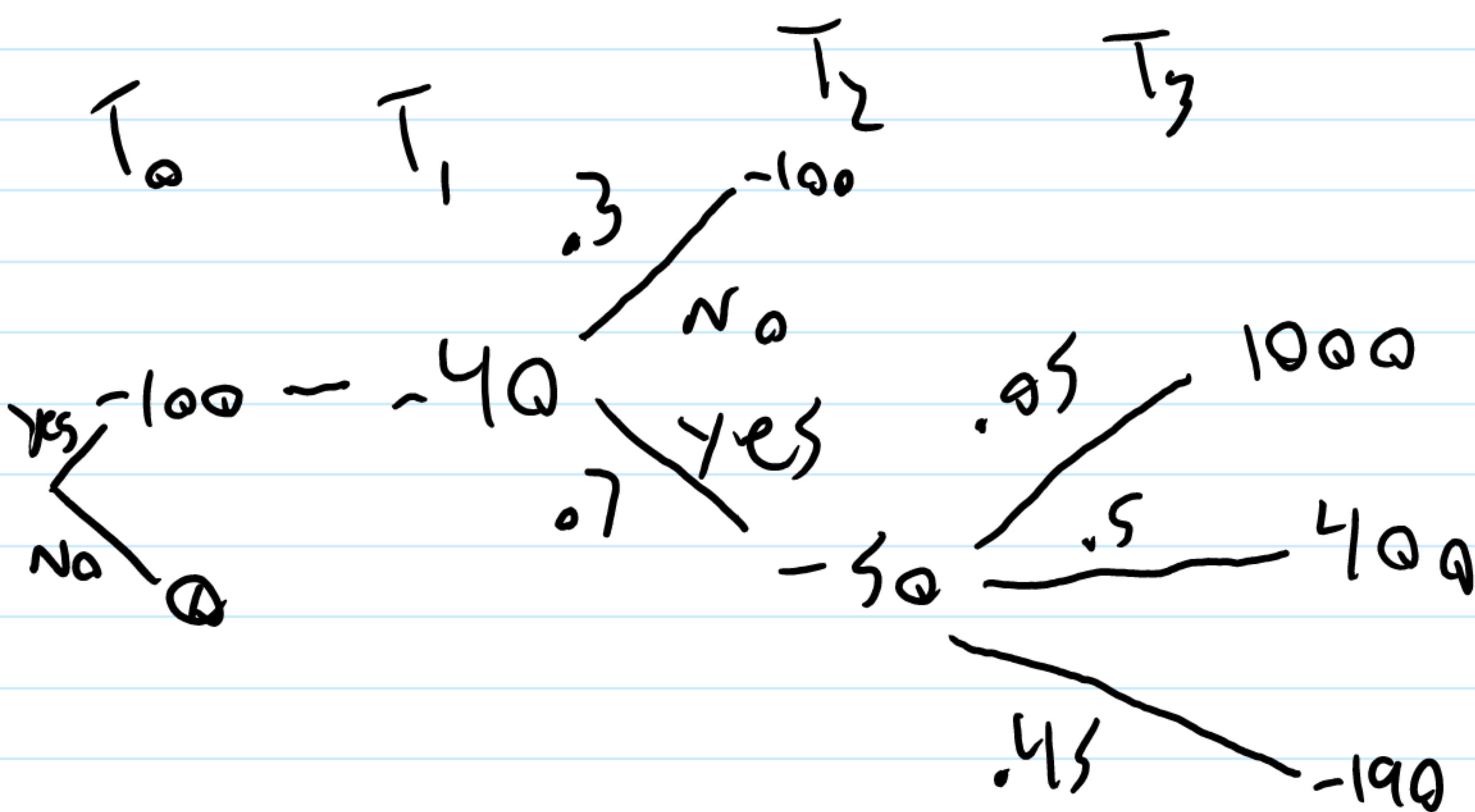
Problem 4

Saturday, January 23, 2021 12:46 PM



Jason is considering developing a process innovation. It requires an initial investment of \$100, then another investment of \$40 after one year. Jason thinks the probability it will turn out to be feasible after two years is 0.7. If it is feasible, it will then take another expenditure of \$50 (2 years from the initial investment) to complete. It will then be ready to demonstrate 3 years from the initial investment. Jason thinks there is a 0.05 probability that with a successful demonstration he will sell his innovation for \$1,000 and a 0.5 probability he will sell it for \$400, and that otherwise there will be no interest. The annual discount rate (riskless rate of return) is 5%. There are no other costs and Jason is risk neutral.

a. Illustrate the decision(s) to be made with a decision tree.



b. What is the present expected value of the project?

$$\left(\frac{-100}{1.05^0}\right)(1) - \left(\frac{40}{1.05^1}\right)(1) + \left(\frac{0}{1.05^2}\right)(.3) - \left(\frac{-50}{1.05^2}\right)(.7) + \left[\left(\frac{1000}{1.05^3}\right)(.05) + \left(\frac{400}{1.05^3}\right)(.5) + \left(\frac{0}{1.05^3}\right)(0)\right](.7) = -18.67$$

c. What probability of selling the project for \$400 would make Jason indifferent between pursuing it or not, assuming P(1000) stays the same?

$Q = -100 - \frac{40}{1.05} + .7\left(-\frac{50}{1.05^2} + \left(\frac{1000}{1.05^3} + .05\frac{1000}{1.05^3}\right)\right)$
 $45 = .577$

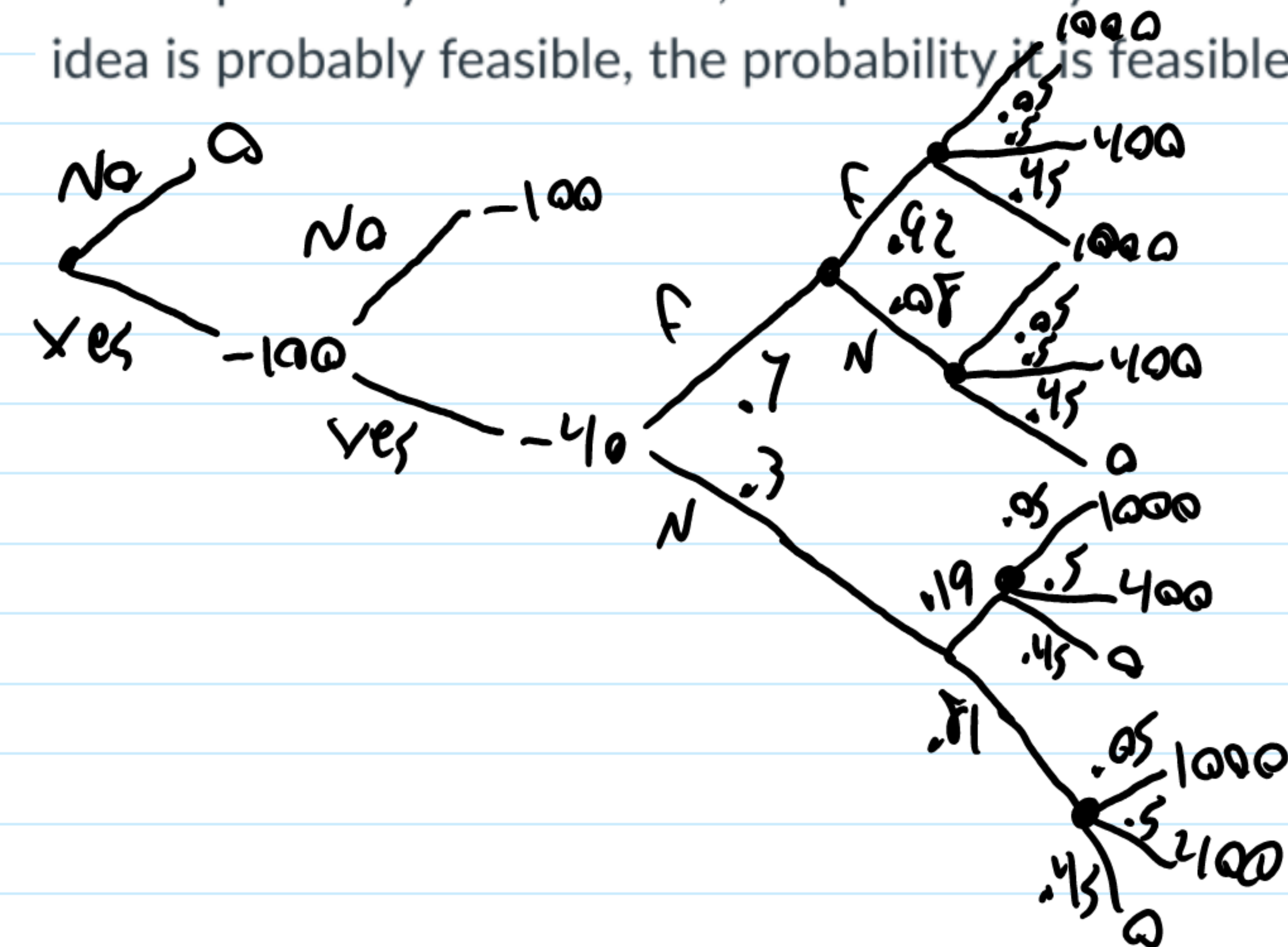
Using Solver... = .5771775

	A	B	C	D	E	F	G	H	I
1	time	0	1	2	2	3	3	3	
2	value	-100	-40	0	-50	1000	400	0	
3	prob	1	1	0.3	0.7	0.05	0.5772	0.3728	
4	1.05								sum
5		-100	-38.1	0	-31.75	43.192	199.44	0	0

d. Jason may obtain an expert's opinion of the feasibility of his idea for a fee. Suppose the consultant's studied opinion is completely accurate and Jason thinks there is a 70% chance they will find the innovation feasible. How much is the opinion worth?

$(.05 \cdot 1000) + (.5 \cdot 400) + (.45 \cdot -190) = 164.5$
 $164.5 - (-100) = 264.5$
 $EV = -100 - \frac{40}{1.05} + .7\left(-\frac{50}{1.05^2} + \left(.5\frac{400}{1.05^3} + .05\frac{1000}{1.05^3}\right)\right)$
 $IF\ info, EV = .7 \cdot 32.51 + .3 \cdot 0 = 22.76$
 $Info - no = 22.76 - 0 = 22.76$

e. Suppose, having dealt with consultants on similar projects, Jason guesstimates there is a 0.7 probability the consultant will report the innovation is probably feasible and otherwise the consultant will report the idea is probably not feasible. Jason thinks that if the consultant says the idea is probably not feasible, the probability it is feasible is 0.19 and that if the consultant says the idea is probably feasible, the probability it is feasible is 0.92. How much is the opinion worth?



This is definitely wrong :-)

$PV = -100 - \frac{40}{1.05} + \left(\frac{50}{1.05^2} \cdot .7 \cdot .92 \cdot 164.5\right)$
 $EV = -100 - \frac{40}{1.05} + .92\left(-\frac{50}{1.05^2} + \left(.5\frac{400}{1.05^3} + .05\frac{1000}{1.05^3}\right)\right) = 18.86$
 $Thus, with info EV = .7 \cdot 18.86 + .3 \cdot 0 = 13.2$