#	Question	Answer(s)
1	Is the granularity of a capacitive touchscreen limited by the number of pixels?	More or less. There are some interesting signal processing techniques we can interpolate between multiple pixels to fill in the gaps. The number of touchscreen pixels is usually different from the number of display pixels.
2	Is an electrode the conductive plate of a capacitor?	yes
3	How do you create C1 with your touch? How is it not there before the touch?	the material at the "surface" of the screen, where you touch, is not conductive, so it can't form a capacitor without you touching it to make it more conductive.
4	what exactly make up the plates of these capacitors? Is it the electrodes and the fingers?	exactly, the plates are the top and bottom metal and your finger
5	Is our finger the conductive plate or the node?	both i think
6	would c2 = c1 + c0?	No. First, since C1 and C0 are in series, we don't add them up like this. Then, we also have some dimensional differences, so C2 is distinct from C1 and C0.
7	How do electrons flow to the top capacitor's bottom plate? Don't all the electrons go to the bottom capacitor's bottom plate?	The charges on the top cap's bottom plate come from the floating node. Those charges on that node get balanced by the middle cap's top plate. The charges going to the bottom cap plate bottom cap do balance with the top cap top plate, but for a slightly different reason.
8	for the capacitive touchscreen, i'm still confused how C0, C1 (or the capacitors that connects with the "finger" conductive plate) appears when the finger touches, and disappears when finger no longer makes contacts with the screen.	The material in the screen (where you finger touches) is not conductive, so it can't form a complete capacitor on its own. Only when you touch it does it become conductive enough t o form a capacitor.
9	So, there is some charge initially in the floating node, which we don't know where it comes from (we know that it doesn't come from the voltage source)?	Yes, there are a bunch of free + and - charges in the floating node that sum up to 0 (neutral) that are just always there. The imbalance in charges pushes them around to sit on the caps.
10	Do we only have floating nodes with capacitors?	We usually need switches with caps to form floating nodes
11	What's the difference between q and Q?	in this case, nothing in particular
12	How come the net charge of floating node is the same as Qev after we apply the capacitors in series formula?	There are 3 steps to this: first is equivalent capacitance, which tells us the Q that appears on the top of the top cap, and the bottom of the bottom cap. 2nd step is the equal + opposite charge on the caps. Last is charge conservation on the floating nodes. There's a good diagram for this in yesterday's discussion.
13	What would happen if we did not add the short circuit?	Then we would have some initial charge on the cap, which we would have to tell you so you that its conserved after the charge is shared.

14	When she says "charges don't want to go there", what is actually happening that prevents electrons from going to a circuit section?	Charges can only travel where there is some full circuit loop. So if there is no full loop, the charges won't go.
15	For capacitors in series, what if we have a voltage source	The caps in series will all have the same charge across them. We'll end up with different voltages on each of the caps, related to the Q=CV rule.
16	shoudn't equation for I1 have numerator c2 if it's multiplied by c1?	No, it should be C1 in the numerator for current through C1
17	how would we approach the problem if we have capacitors in parallel with a voltage source instead?	In that case, the voltage across each cap is equal to the voltage source
18	How does q = V1*C1 = Ceq * Vs? Is it the same charge throughout the circuit?	For the capacitors in series, we get the same charge on all the capacitors
19	what is dvout/dt equal to in Is = Ceq(dvout/dt)?	Vout is the voltage across the caps, our "output voltage". So dVout/dt is the change of voltage wrt to time.
20	What is the current equation of capacitors in parallel again?	I1 = Is * C1 / (C1 + C2)
21	Does it matter that C1 isn't connected to ground?	We are purposefully not connecting it to ground. Its separate node.
22	how did you know which ones are closed and open?	Which phase a switch is open / closed is part of the circuit definition
23	what does a coulomb represent physically?	A coulomb is measure of charge. Most basically, you can think of it as the presence or absence of electrons.
24	why does c2 being connected to ground in phase 1 not affect chargin?	In phase 1, the charge on C2 is defined by the Q=C2*Vs. That is independent of the ground node
25	How does a charge "know" that a circuit section is not complete and avoid going there?	Charges can only flow through circuit loops. If a loop doesn't exist, the charge won't go through.
26	How do we know which switches to turn on/off for phases 1 and 2?	Which switches are on and off are part of the circuit definition, like cap or resistors values.
27	if we take out the Vs, and just discharge both capacitors, is the charge still conserved in the floating node?	It depends on what you mean by "discharge". If you just replcae Vs with a wire, then yes the charge is conserved at the floating node. Usually discharging means connecting both ends of each capacitor together, which gives us Q = C* (0V) = 0.
28	why is q_1 negative?	at the floating node, Q1 is negative because of the charge sign polarities.
29	shouldnt it be -C1 and -C2 in the matrix	live answered
30	What is the numerator on with touch?	C0 + Cdelta
31	why is without touch higher	voltage with touch should be greater, so if it is above some threshold value, then it signifies a touch.
32	What is C delta?	C delta is the change in Ceq after we touch it
33	What is the numerator on without touch?	Just C0
34	How does the opamp work inside	we're going to skip over that. Lots of transistor stuff. Take EE140 if you want to learn how to build op amps.
35	what is vDD and vSS?	VDD and VSS are power supplies for the op amp, some voltage values. They also define output levels for Vcomp

36	Shouldn't there be 2 wires, one for vss and one for vdd	For your physical op amp, yes. But it doesn't appear in this model. We just use the value
37	so does an op-amp have four terminals to which you can connect stuff?	there's a minimum 5 terminals: V+, V-, Vout / Vcomp, VDD, VSS
38	How is the voltage dependent source Vdd-Vss/2 if there is no Vdd in the circuit	It is physically connected to the op amp, but the VDD source doesn't appear in the model. We just use the value in the dependent source
39	Why is Vdd equal to Vss, I thought the point was that thye were different	Should be VDD = -VSS
40	How is Vdd-Vss =0, I thought Vdd and Vss had to be different	Should be VDD = -VSS
41	Should A be negative in the equation?	A is positive. We want some gain times the difference of the inputs
42	Why does (VDD+VSS)/2 go to 0? If VDD=VSS, wouldn't we be left with VDD (or VSS)?	Oh my bad! This was answered in a question above. Ty!
43	Shouldn't Vout = A(V+ - V-) + Vss, since Vdd + Vss is equal to 2 Vss (because Vdd = Vss)?	Should be VDD = -VSS actually, she made that correction toward the bottom
44	why vout gets saturated at vdd and vss again?	The output is limited by our power supply rails (not modelled in the equations), so our A*(v+ - v-) will max out at VDD and min out at VSS
45	Why is f multiplied by vout?	