Alexander & Sadiku Practice Problem 10.1
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```
> restart
```

Handy functions for dealing with phasors

```
> j := I:
> polard := (mag, angd) → polar(mag, angd*Pi / 180) :
> argumentd := (num) → argument(num) * 180 / Pi :
> listphasors :=proc(plist) local k
  for k from 1 to nops(plist[ ]) do
  printf("%s = %f < %f deg\n", lhs(plist[ ][k]), evalc(abs(rhs(plist[ ][k]))),
      evalc(argumentd(rhs(plist[ ][k]))))
   end do end proc:
```

Circuit equations

$$> KCLn1 := -Ia + \frac{(V1 - 0)}{R1} + (V1 - V2) \cdot jomega \cdot C = 0 :$$

$$> KCLn2 := (V2 - V1) \cdot jomega \cdot C + \frac{(V2 - 0)}{jomega \cdot L} + \frac{(V2 - b \cdot Vx)}{R2} = 0 :$$

$$> CTRL := Vx = V1 :$$

Solve circuit equations

$$> MySoln := solve(\{KCLn1, KCLn2, CTRL\}, [V1, V2, Vx]) :$$

Collect jomega to put into more useful form

$$> collect(MySoln, jomega)$$

$$\left[\left[V1 = -\frac{Ia\,R1\,(C\,L\,R2\,jomega^2 + L\,jomega + R2)}{(C\,L\,R1\,b - C\,L\,R1 - C\,L\,R2)\,jomega^2 + (-C\,R1\,R2 - L)\,jomega - R2}, V2 = -\frac{Ia\,R1\,L\,jomega\,(C\,R2\,jomega + b)}{(C\,L\,R1\,b - C\,L\,R1 - C\,L\,R2)\,jomega^2 + (-C\,R1\,R2 - L)\,jomega - R2}, Vx = -\frac{Ia\,R1\,(C\,L\,R2\,jomega^2 + L\,jomega + R2)}{(C\,L\,R1\,b - C\,L\,R1 - C\,L\,R2)\,jomega^2 + (-C\,R1\,R2 - L)\,jomega - R2}\right]\right] \quad (1)$$

Define lists for known values

$$> Vals := R1 = 2, R2 = 4, L = 2, C = 0.2, jomega = j \cdot 2, Ia = polard(10, 0), b = 3 :$$

Find numerical solutions

$$> MySoln := subs(Vals, MySoln) :$$

Find phasors

```
> listphasors(MySoln)
V1 = 11.327042 < 60.018361 deg
V2 = 33.023719 < 57.127091 deg
Vx = 11.327042 < 60.018361 deg
>
```

Conclusion: v1(t) = vx(t) = 11.327 cos(2 t + 60.01 deg), v2(t) = 33.024 cos(2 t + 57.13 deg)