Diode circuits

Clippers and Clampers
First clipper circuit

- Diode is forward biased during positive half cycle
  - This makes the positive potential 0.7V
• Output swings from 0.7V positive to -50V negative
Second clipper circuit

- Diode is forward biased during negative half cycle
  - This makes the negative potential 0.7V
• Output swings from +24V positive to -0.7V negative
Third clipper circuit

- Since diodes are in series, each branch will drop $0.7V + 0.7V = 1.4V$
  - Branches are in parallel
• Output swings from +1.4V positive to -1.4V negative
Fourth clipper circuit

- First, determine potential at $V_{BIAS}$
  
  $$V_{BIAS} = \frac{1k}{6.8k+1k} (15) = (0.128)(15) = 1.92V$$

- Since diode requires positive potential of 0.7V and adds to $V_{BIAS}$, maximum positive potential becomes 2.62V
• Waveform swings from +2.62V positive to -20V negative
First clamper circuit

- DC potential is \( pk - 0.7V = 14.3V \)
  - This becomes the zero reference line for the AC, so it will go 15V above and 15V below this line
• Output swings from +29.3V positive to -0.7V negative
Second clamper circuit

- DC potential is \( pk - 0.7V = 29.3V \)
  - This becomes the zero reference line for the AC, so it will go 30V above and 30V below this line
• Output swings from +0.7V positive to -59.3V negative
Third clamper circuit

- This one charges the capacitor during the positive alternation, and this will then discharge during the negative alternation.
- This makes the output at maximum a straight line of 40V (2Vpk)
• However, since the diode is not perfect we need to use the first approximation (simplified diode)
  – This means we need to subtract 0.7V for the one diode that charges the capacitor (39.3V)
  – And lest we forget, subtract the potential for the second diode as well (38.6V)
• Output is pulsating wave (ripple) that rises to a maximum potential of 39.3V and descends to a minimum potential of 38.6V