1. See attached. Straight line on semilog scale = exponential
   \( \text{(so } I \approx \text{ e}^V \text{)} \)

2. Adjustable waveform clipper: \( V_{in} \rightarrow V_{out} = \frac{V_{in} + 6V}{6V} \)

   Diode is off for \( \text{Vin} < 6.6 \text{ V} \) (0.6 V drop across diode to turn on).

   So for \( \text{Vin} < 6.6 \text{ V} \), diode is like \( \infty \) R and \( V_{out} = V_{in} \).

   Diode is on for \( \text{Vin} \geq 6.6 \text{ V} \), and when diode is on, there's a 0.6 V drop across diode (resistor limits current + takes rest of voltage).

   So for \( \text{Vin} \geq 6.6 \text{ V} \), \( V_{out} = 6.6 \text{ V} \) → input will be clipped at 6.6 V.

a) If input = 5 Vpp triangle wave, amplitude = 2.5 V → not clipped, \( V_{out} = V_{in} \).

b) If input = 8 Vpp, amplitude = 4 V
   Still not clipped, \( V_{out} = V_{in} \).

3. a) \( \text{Vin} = +2 \text{V} \): neither diode on, so \( V_{out} = \text{Vin} = +2 \text{V} \)

   +4 V: \( R \) diode on, so current flows and \( V_{out} = 3.6 \text{V} \) \( (V_R = 0.4 \text{V}) \)

   +6 V: \( R \) diode on, \( V_{out} = 3.6 \text{V} \) \( (V_R = 2.4 \text{V}) \)

   -2 V: neither diode on, so \( V_{out} = \text{Vin} = -2 \text{V} \)

   -4 V: neither diode on, so \( V_{out} = \text{Vin} = -4 \text{V} \)

   -6 V: \( L \) diode on, so current flows through \( L \) diode + \( V_{out} = -5.6 \text{V} \)
   \( (V_R = -0.4 \text{V}) \)

b) \( \text{Vin} = 10 \text{V} \) amplitude sine wave will be clipped at \(-5.6 \text{V}, +3.6 \text{V}\)

c) When \( \text{Vin} = -8 \text{V} \), \( L \) diode is on, so \( I \) flows up through \( L \) diode, then to left through resistor.

d) With no resistor in the circuit, there'd be nothing to limit the current through the diode(s), and when the voltage across a diode got to be larger than \( \approx 0.7 \text{V} \), enough current would flow to destroy the diode.