15. A series circuit consists of a 22 h inductor and a 68Ω resistor. A current i = 2t 2 + t exists in this combination. After what time t does the voltage across the combination equal 375 volts? $t = 1.784s$

16. A voltage v = t3 + 1,000 volts appears across a parallel RC combination, where R = 2 MΩ and C = 1μf. Find the resulting current ig at any time t.
$ig = 3 \times 10^{-6}t^2 + 500 \times 10^{-9}t^3 + 500 \times 10^{-6}$

17. A transistor operates into a load resistance of 2.2 kΩ. The shunt capacitance in the circuit equals 70 pf, as measured at the collector. Over a certain interval the output voltage supplied by the transistor equals v = 1x107 t + 30 volts. Find the collector signal current when t = 10 μs.
$ic = 59.791mA$

18. A current i = 10t 1/2 + 0.1 amps flows through a series RL circuit, where R = 800Ω and L = 320 h. Find the voltage vg across this circuit when t = 0.04 second. $vg = -6.32Kv$

19. A transistor collector has a load resistor of 4.7 kΩ with a compensation inductor L = 20 mh in series with the resistor. The current i through the combination equals 2.5x104 t + 0.01 amps. Find the voltage across the RL circuit when t = 25 ns. $vg = -450.063v$

20. A 27 kΩ resistor shunts a 33μf capacitor. The applied voltage v equals 300t 2 volts. At what time t does the total current i equal 84 mA? $t = 1.999s$

21. The voltage applied across a capacitor of 0.2 μf was v = 5 - 3t2 volts. The energy stored in a capacitor is w = Cv 2 /2 joules. Find a formula for dw/dt in this capacitor. $\frac{dw}{dt} = -1.2 \times 10^{-6}t(5 - 3t^2)$ OR $= 3.6 \times 10^{-6}t^3 - 6 \times 10^{-6}t$

22. The intensity I of light from a tungsten filament varies with the applied voltage according to I = Av 3.7, where A is a constant and v is the applied voltage. If v = t - 2t 2 , find a formula for dI/dt.

$$\frac{di}{dt} = 3.7a(t-2t^2)^{2.7}(1-4t)$$

23. When a length l meters of a conductor moves at a speed of v meters per second in a magnetic field of uniform flux density β teslas, a voltage is induced equal to v = -βlv volts. If v = 10 meters per second, l = 0.3 meter, and β varies over a certain interval according to β = 1/t 2 , find dv/dt when t = 0.5 seconds. $\frac{dv}{dt} = 48v/s$

24. The frequency of a certain crystal oscillator varies with temperature T according to f = fa[1 + k(T - Ta)], where fa is the frequency at an initial temperature Ta and k is a constant of the crystal. If T varies with time (t minutes) according to T = 55 + 0.01t 2 , how fast does f change when t = 10? $\frac{df}{dt} = fak(.2)$

25. The wavelength λ meters of a radio wave traveling at a speed c = 3 x 108 meters per second varies with the frequency according to λ = c/f. If f = 1 x 108 + (5 x 107)t ½ hertz find a formula for dλ /dt.

$$\frac{d\lambda}{dt} = \frac{-7.5\times10^{15}}{(1\times10^8+5\times10^7 t^{\frac{1}{2}})^2 t^{\frac{1}{2}}}$$

26. The voltage v across a varying resistor r, carrying a fixed current I, is v = Ir. If r varies with time t according to r = t3 + 5, find a formula for dv/dt in this capacitor. $\frac{dv}{dt} = 3t^2I$

27. The mutual inductance between two windings is M = N2ϕ2/i1, where i1 is the current in one of the windings and N2 and ϕ2 are the number of turns of the second winding and the flux linking it to the first winding. If i1 and N2 are constant, and if the second winding moves so that ϕ2 varies with time t seconds according to ϕ2 = t 3 - 2t, find a formula for dM/dt.

$$\frac{dm}{dt} = \frac{n_2}{i_1}(3t^2-2)$$

28. A copper wire of diameter d and length s has a resistance of r = ks/d2 , where k is a constant. Suppose a sliding wire changes the length so that s = t2 - 0.6t, where t is in seconds. Find a formula for dr/dt.

$$\frac{dr}{dt} = \frac{k}{d^2}(2t - 0.6)$$

29. The force between two charged particles having fixed charges Q1 and Q2 varies with the distance separating them according to F = Q1Q2/4πεs 2 . If ε is a constant, and if s varies with time as s = 6t 3/2, find a formula for dF/dt.

$$\frac{df}{dt} = \frac{-Q_1 Q_2}{48\pi\varepsilon t^4}$$