Calculus for Electronics, Problems 10-2, Differentials:

1. An electron (whose mas is ) moves at a speed . Its momentum is . Find a formula for the approximate change in momentum resulting from a small increase in speed.
2. The low-frequency inductance of a single-layer solenoid is approximately , where is a form factor, is the diameter in centimeters, and is the number of turns. Find a formula for the approximate change in the inductance resulting from the addition of a small part of a turn .
3. The power in a circuit was watts. What was the approximate energy in joules expended from to seconds.
4. The induced voltage in an 8-henry inductor varied according to . About how much change occurred in the inductor current from to seconds?
5. The power in a circuit is given by watts, where and is the current in amperes. If changes from to amps, approximately what change occurs in watts?
6. The current amperes in a circuit varied with time t seconds according to . About what current change occurred as t changed from tosecond?
7. The intensity of the heat radiation from a transmitting tube plate varies with its absolute temperature according to where is a constant and is the temperature in . If units when , approximately what change in results from a change in to ?
8. If the resistance ohms in a circuit varies with time seconds according to , what approximate change in occurs as changes from to seconds?
9. A right circular cone used in constructing a broadband antenna has a volume , where is the radius of the base and is the altitude of the cone. If centimeters and centimeters, what approximate change in the volume occurs when changes to centimeters?
10. An increase in the apparent mass of a moving particle occurs in accord with where is the mass of the particle at rest, is its speed, and is the speed of light in a vacuum. What approximate change occurs in the apparent mass as a result of a small change in the speed of the particle? Express your answer as a formula.