Question 1

```
x = [1 2 3 4 5 6 7 8 9 10]';  % Years
y = [500 520 540 560 590 620 640 660 680 700]';  % Population
n = length(x);
sum_x = sum(x);
sum_y = sum(y);
sum_x2 = sum(x.^2);
sum_xy = sum(x .* y);
a1 = (n * sum_xy - sum_x * sum_y) / (n * sum_x2 - sum_x^2);
a0 = (sum_y - a1 * sum_x) / n;
fprintf('The linear equation is: y = %.4fx + %.4f\n', a1, a0);
x_predict = 12;
y_predict = a1 * x_predict + a0;
fprintf('The predicted population in year 12 is: %.2f\n', y_predict);
```

question 2

```
t2 = [0 1 2 3 4 5];
M = [100 80 64 51.2 40.96 32.768];
log_M = log(M);
N2 = length(t2);
sum_t2 = sum(t2);
sum_log_M = sum(log_M);
sum_t2_log_M = sum(t2 .* log_M);
sum_t2_squared = sum(t2.^2);
k = (N2 * sum_t2_log_M - sum_t2 * sum_log_M) / (N2 * sum_t2_squared - sum_t2^2);
ln_M0 = (sum_log_M - k * sum_t2) / N2;
M0 = exp(ln_M0);  % Back-transform to get M_0
```

```
% Print the result in the requested format
fprintf('The linear equation for Problem 2 is: ln(M) = %.4f * t + %.4f\n', k, ln_M0);
fprintf('The exponential decay equation is: M(t) = %.4f * e^(%.4f * t)\n', M0, k);
```

question 3

```
t1 = [0.5 1 2 3 4 5 6 7 8];
C = [20.0 18.5 15.2 12.5 10.2 8.7 7.1 5.8 4.5];
log_t1 = log(t1);
log_C = log(C);
N1 = length(t1);
sum_log_t1 = sum(log_t1);
sum_log_C = sum(log_C);
sum_log_t1_log_C = sum(log_t1 .* log_C);
sum_log_t1_squared = sum(log_t1.^2);
b1 = (N1 * sum_log_t1_log_C - sum_log_t1 * sum_log_C) / (N1 * sum_log_t1_squared - sum_log_t1^2);
ln_a1 = (sum_log_C - b1 * sum_log_t1) / N1;
a1 = exp(ln_a1);  % Back-transform to get 'a'
% Print the result in the requested format
fprintf('The linear equation for Problem 1 is: ln(C) = %.4f * ln(t) + %.4f\n', b1, ln_a1);
fprintf('The power law equation is: C(t) = %.4f * t^%.4f\n', a1, b1);
```