Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. (a) Find an equation for the line ℓ passing through the point $(-3, 12)$ that is perpendicular to the line ℓ' which passes through the points $(-5, 1)$ and $(2, 15)$.

(b) Your sister McKenzie is looking for a summer job at a department store.
   - Store M offers \$14 per hour plus a 3% bonus on all sales.
   - Store W offers only \$10 per hour, but, also, a 5% bonus on all sales.

   What would the amount of sales x that your sister achieves in an 8-hour day have to be for store W to be a more attractive option for her?

2. The population P of a certain species as a function of time t in months is given by the following table.

t	1	2	3	4	5	6
$P(t)$	3	15	25	40	51	60

(a) Give the linear regression line $P(t)$ and the correlation coefficient r. Please round in three decimal digits.

(b) Use the model to find (by hand) in how many months the population will reach 200 individuals.

3. (a) Let $f(x) = 3x^2 - 12x + 7$. Write $y = f(x)$ in standard form.

(b) Suppose x and y are two numbers, such that $2x$ and y add up to 500.

(i) Write an equation giving y in terms of x.

(ii) Write an equation giving the product p of x and y in terms of x only.

(iii) Based on Part (ii), find x and y so that their product is maximum.

4. (a) Find the x-intercept(s) (zeroes) of $f(x) = x^3 - 3x^2 - x + 3$.

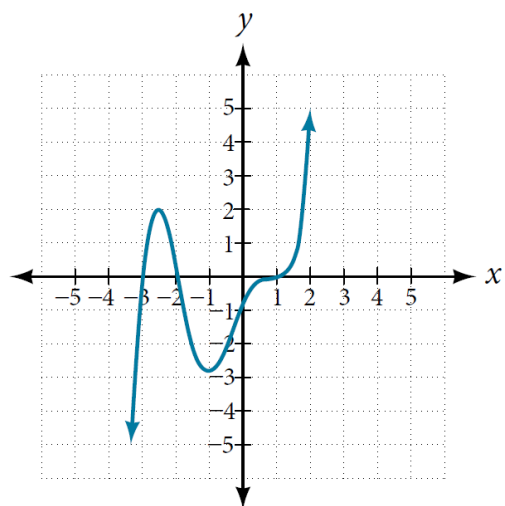(b) Let $f(x) = (x+2)^3(x-1)^2$ $[= x^5 + 4x^4 + x^3 - 10x^2 - 4x + 8]$.

(i) Find the y-intercept.

(ii) Find the x-intercept(s) together with their multiplicities.

(iii) Identify the end behavior of $f(x)$.

(iv) Sketch the graph of $y = f(x)$.

5. Consider the graph of $y = f(x)$ shown below.

(a) Find the y-intercept.

(b) Find the x-intercept(s) with multiplicities.

(c) Find a formula for $y = f(x)$.