

Math 121 Review sheet for test 2

- Find the profit function, which is a **quadratic** function, satisfies ALL the function conditions:
  - the break even units for this profit function is at  $x = 50$  and  $x = 150$ .
  - the maximum profit is \$10,000.
- Find a polynomial  $f$  satisfies the following conditions:
  - $f$  has repeated  $x - \text{intercepts}$  (even number of times) at  $x = -1$  and  $x = 3$ ;
  - $f$  has *non-repeated*  $x - \text{intercepts}$  at  $x = -2$  and  $x = 4$ .
  - $f(-5) < 0$ .
- Sketch the graph which you have found in question above.
- Find a polynomial  $f$  satisfies the following conditions:
  - $f$  has repeated  $x - \text{intercepts}$  (even number of times) at  $x = 3$ ;
  - $f$  has non-repeated  $x - \text{intercepts}$  at  $x = 1$  and  $x = 4$ .
  - $f(5) < 0$ .
- Sketch the graph which you have found in question above.
- Find the profit function, which is a quadratic function and satisfies ALL the following conditions: (a) the company breaks even when  $x = 100$  and  $x = 300$  units are produced, (b) the maximum revenue is \$40,000.
  - $P(x) = 4(x - 100)(x - 300)$ ,
  - $P(x) = -2(x - 100)(x - 300)$ ,
  - $P(x) = 2(x - 100)(x - 300)$ ,
  - $P(x) = -4(x - 100)(x - 300)$  (correct).
  - None of above.
- Find a profit function  $P(x)$  satisfies the following conditions, where  $x$  denotes number of units are produced and  $P(x)$  is a polynomial function: (a) the company breaks even at  $x = 200, 400$  and  $600$  units (b) the profit function  $P(x)$  changes signs (from  $P(x) > 0$  to  $P(x) < 0$  or vice versa) at  $x = 400$  but  $P(x)$  does not change sign at  $x = 200$  and  $600$ , (c) the company is profitable when 50 units are produced.
  - $P(x) = (x + 200)^2(x + 400)(x + 600)^4$
  - $P(x) = -(x - 200)^2(x - 400)(x - 600)^4$  (correct)
  - $P(x) = (x - 200)^2(x - 400)(x - 600)^4$
  - $P(x) = -(x - 200)(x - 400)^2(x - 600)$
  - None of above.
- For  $f(x) = x^2(x - 1)[2x + 3]$ 
  - find the  $x - \text{intercepts}$  of  $f$ ,
  - find the interval(s) where  $f(x) > 0$ ,
  - sketch the graph for  $f$ .
- A company's profit function  $P(x)$  (when  $x$  number of units are produced) resembles a polynomial function and satisfies ALL the following conditions:
  - The profit function breaks even at  $x = 100, 400$  and  $500$  units.
  - The profit function  $P(x)$  changes signs (from  $P(x) > 0$  to  $P(x) < 0$  or vice versa) at  $x = 100$  but  $P(x)$  does not change signs at  $x = 400$  and  $500$ .

- c. The company is profitable when 50 units are produced.  
**Then** (a) find a profit function which satisfies all the conditions mentioned above. (b) Predict if 300 units is produced, would the company be profitable?
10. True or False:
- Any odd degree polynomial has at least one  $x$ -intercept.
  - Any even degree polynomial has at least one  $x$ -intercept.
  - The function  $f(x) = x^5 + 3x^2 + 5x - 4$  has no  $x$ -intercept in the interval of  $[0, 1]$ .
  - For a degree four polynomial,  $f(x) = ax^4 + bx^3 + cx^2 + dx + e$ , the number  $e$  will affect the graphs of  $y = ax^4 + bx^3 + cx^2 + dx$  in horizontal direction.
11. Find two functions which have the domain of  $[3, \infty)$  and the range of  $(-\infty, 3]$ .
12. Let  $f(x) = \sqrt{-x}$ .
- Find the function  $f_1$  so that the graph of  $y = f_1(x)$  is being reflected along  $x$ -axis.
  - Find the function  $f_2$  so that the graph of  $y = f_2(x)$  is being shifted to the right 2 units and down 3 units from  $f_1$ .