College Algebra w.B.A. — Joysheet 7 MAT 120, Spring 2014 — D. Ivanšić

Name: Saul Ocean

Show all your work!

1. (12pts) Graph the function $P(x) = 2(x+3)^2(x-1)x$ by following the guidelines.
a) Find the x-intercepts of the graph and the y-intercept.
b) What is the graph like for large $|x|$?
c) Find the turning points of P.
d) Sketch the graph of the function on paper. Make sure scale is marked and all features you found in a)-c) are indicated.

a) $2(x+3)^2(x-1)x = 0$

$x = -3, 1, 0$

$y = P(0) = 0$

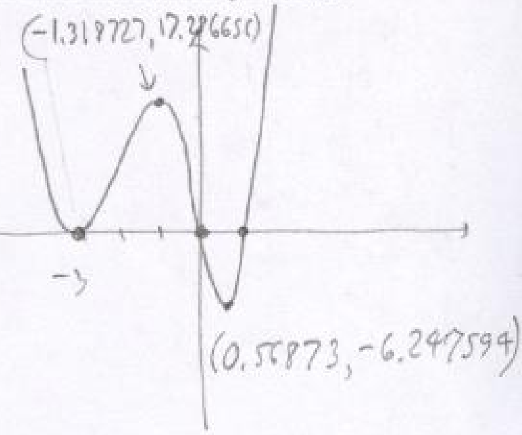
b) $2 \cdot x^2 \cdot x \cdot x = 2x^4$
term with highest exponent is $2x^4$
Will look like $2x^4$ for large x

c) $(-3, 0)$

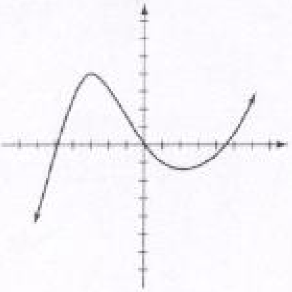
$(-1.318727, 17.276656)$

$(0.56873, -6.247594)$

d)

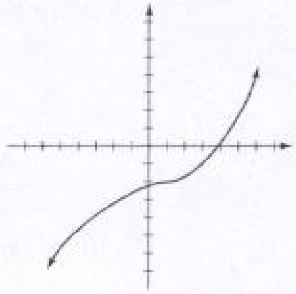


2. (8pts) Under each graph below, write 2, 3, 4 or 5 if it could be the graph of a polynomial of degree 2, 3, 4 or 5. More than one number per graph is possible.

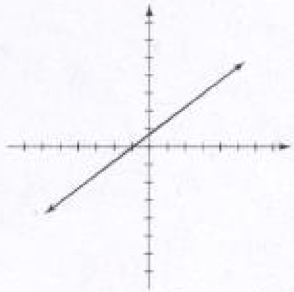


3, 5

4



3, 5



none (or 1)

3. (10pts) The cost of producing x fruit baskets is $C(x) = +0.5x^2 + 15x + 550$. Suppose the manufacturer can sell the fruit baskets to a grocery chain for \$25 apiece.
a) Write the revenue and profit function for selling x baskets of fruit.
b) How many fruit baskets should be sold in order to maximize the manufacturer's profit? What is the maximal profit?

a) $R = 25x$

b) $P(x) = R(x) - C(x)$

$= 25x - (0.5x^2 + 15x + 550)$

$= -0.5x^2 + 10x - 550$

Looks like ∩

Vertex: $h = -\frac{b}{2a} = -\frac{10}{2 \cdot (-0.5)} = 10$

$k = -0.5 \cdot 10^2 + 10 \cdot 10 - 550 = -500$

Maximal profit is still a loss of 500 when producing 10 baskets.

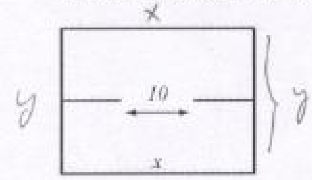
Bonus. (2pts) Use the grade computer on the website to find out your current grade based on exams 1&2 and joysheets 1–6. Assume no points for attendance and a 3 for your participation grade, and enter exam scores with bonus points included. Write the current overall percentage here and the score you need to increase this percentage to the next letter grade.

4. (15pts) You are building a simple rectangular building with two rooms and a 10-ft opening between them and have enough money to build 200 feet of walls (see picture). Your goal is to maximize the enclosed area.

a) Let x be the length of the building. Find the width in terms of x.

b) Express the area of the building as a function of the x.

c) Sketch the graph of the area function in order to find the maximum (no need for the graphing calculator — you should already know what the graph looks like). What are the dimensions of the building that has the greatest area and what is the greatest area possible?



b) $A = x \cdot y = x(105 - \frac{3}{2}x) = -\frac{3}{2}x^2 + 105x$

a) $2x + x - 10 + 2y = 200$

$3x + 2y = 210$

$2y = 210 - 3x$

$y = 105 - \frac{3}{2}x$

c) x-int:

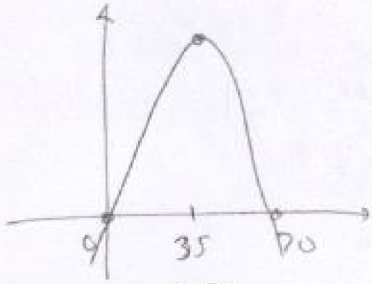
$x(105 - \frac{3}{2}x) = 0$

$x = 0$ or $105 = \frac{3}{2}x$

$x = \frac{210}{3} = 70$

dimensions: 35×52.5

max area: 1837.5



vertex: $h = \frac{0+70}{2} = 35$

$k = 35 \cdot (105 - \frac{3}{2} \cdot 35)$

$= 35 \cdot 52.5$

$=$

5. (15pts) The revenue of a charter boat company depends on the number of unsold seats x. The boat has 150 seats: if 30 are unsold, the ride costs \$160 per seat. Every additional unsold seat increases the price of the ride by \$2.

a) For several values of x, write the price of the ride. Then write an expression for the price of a seat as a function of x.

b) Write an expression for revenue as a function of x.

c) Sketch the graph of the revenue function in order to find the number of unsold seats giving maximum revenue. What is the maximal revenue?

a)

x	price
30	160
31	162
33	166
40	180

$p = 160 + 2(x - 30)$

$= 2x + 100$

b) Revenue = sold seats · price per seat

$= (150 - x)(2x + 100)$

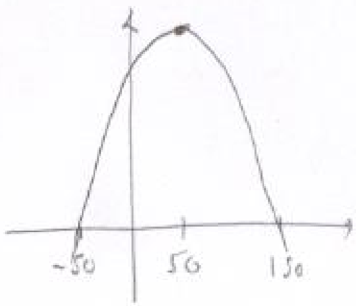
$= -2x^2 + 200x + 15{,}000$

Max. revenue is 20,000 when there are $x = 50$ unsold seats

c) x-int:

$(150 - x)(2x + 100) = 0$

$x = 150, -50$



$h = \frac{150 - 50}{2} = 50$

$k = (150 - 50)(2 \cdot 50 + 100)$

$= 100 \cdot 200 = 20{,}000$