Bishop's University

Math 190: Final Exam
Winter 2015

Name: _____

Student #: _____

- Prepare neat solutions. Briefly justify your work, that is, *make your reasoning clear.*
- All answers must be exact (no decimals allowed) unless specifically directed otherwise.
- This test is 180 minutes in length.
- Do not remove any pages from this test.
- The back of each page may be used for scrap paper.

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0	0	1	2	3	4	5	6	7	8	9	10
1	0	2	3	4	5	6	7	8	9	10	11
2	0	2	4	5	6	7	8	9	10	11	12
3	0	3	6	7	8	9	10	11	12	13	13
4	0	4	8	12	9	10	11	12	13	14	14
5	0	5	10	15	20	11	12	13	14	15	15
6	0	6	12	18	24	30	13	14	15	16	16
7	0	7	14	21	28	35	42	15	16	17	17
8	0	8	16	24	32	40	48	56	17	18	18
9	0	9	18	27	36	45	54	63	72	19	19
10	0	10	20	30	40	50	60	70	80	90	20

Page	Points	Score
2	17	
3	18	
4	19	
5	14	
6	13	
7	11	
8	7	
Total:	99	

1. (5 points) True or False (please circle T of F)
   (a) $\frac{12345}{3}$ represents an integer. ..... T F
   (b) A polynomial of degree 7 can have exactly five (5) x-intercepts. ..... T F
   (c) A function can have exactly two (2) y-intercepts. ..... T F
   (d) The number 1.618 is a rational number. ..... T F
   (e) The functions fg and $f + g$ always have the same domain. ..... T F

2. (9 points) Evaluate exactly
   (a) $\dfrac{3^4 \cdot 3^5}{9^4}$

   (b) $\dfrac{\left(\frac{3}{7} - \frac{1}{5}\right)}{\left(\frac{4}{15}\right)}$

   (c) $\dfrac{\sqrt[3]{256}}{\sqrt[3]{32}}$

3. (3 points) Rationalize the denominator of $\dfrac{7}{5 - \sqrt{11}}$.

4. (9 points) Simplify the following, if possible. Avoid all radicals and negative exponents. All fractions must be in reduced form. Brackets must be removed. Like terms must be combined.

   (a) $\dfrac{y^2 z}{3\,(x^2 y z^{-1})^3}$

   (b) $\dfrac{2y+1}{2y-1} - \dfrac{y-2}{y+1}$

   (c) $\dfrac{\left(\dfrac{x+2}{x^2-1}\right)}{\left(\dfrac{x-1}{x+1}\right)}$

5. (9 points) Expand the following and simplify (remove brackets and combine like terms)

   (a) $(3q-2r)(2r-5q)$

   (b) $x^2(x+1)^3$

   (c) $(4m-3mn+7n)^2$

6. (9 points) Completely factor and simplify the following

   (a) $3k^4 - 12k^2$

   (b) $t^2 + 15t + 54$

   (c) $27x^3 - 125$

7. (5 points) Completely factor and simplify $x^4 - 8x^2 - 9$

8. (5 points) Write the domain of $f(x) = \dfrac{x^2 - 1}{\sqrt{2 + x - x^2}}$ using interval notation.

9. (6 points) Solve

   (a) $7t - 12 = 4t + 21$

   (b) $4x^2 + 13x - 12 = 0$

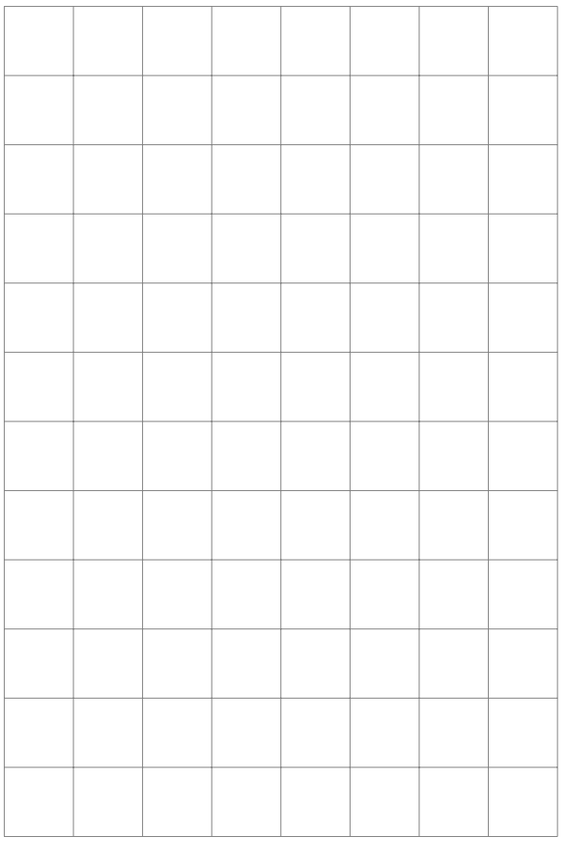
10. (8 points) Solve, and sketch the answer on the real number line.

   (a) $4w - 9 \geq 39$

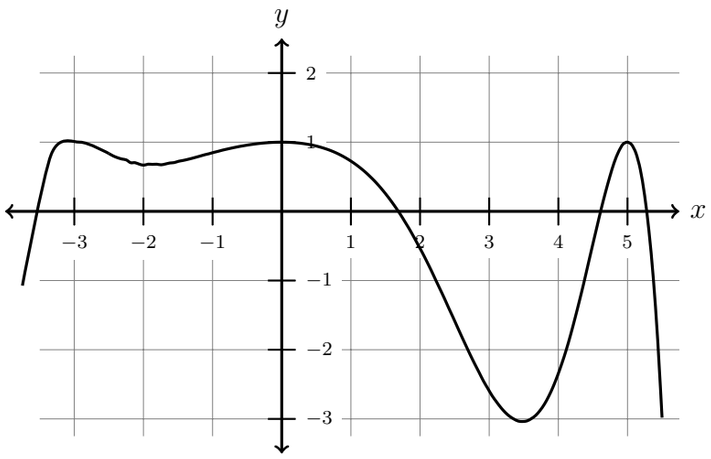
   (b) $\dfrac{2x + 14}{x - 3} < x$

11. (8 points) Fill in the table of values for $f(x) = x^4 + x^3 - 4x^2 - 4x + 3$ and plot the graph of f. Remember to properly place and scale the axes.

x	-2	-1	0	1	2
$f(x)$					



12. (5 points) Consider the graph of the polynomial $p(x)$.



Fill in the blank or circle the answer which makes the sentence true.

(a) The degree of p is (even / odd)

(b) The leading coefficient of p is (positive / negative)

(c) The degree of p must be at least _____.

(d) The value of $p(5)$ is _____.

(e) The number of solutions of $p(x) = -2$ is _____.

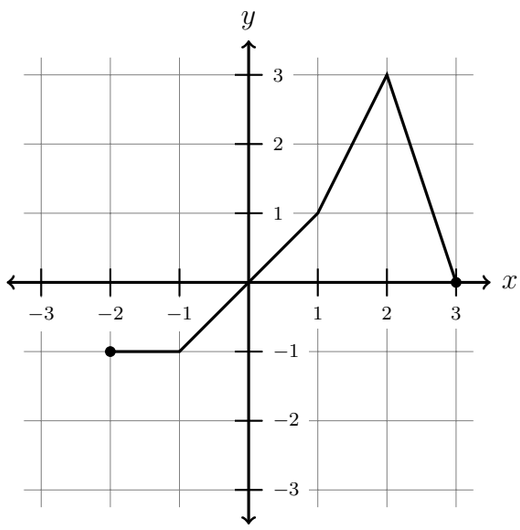
13. (5 points) A rectangular house is located on a rectangular piece of land. The length of the house is 10 feet more than twice its width. The length of the plot of land is 50 feet shorter than five times the length of the house, and the land is 20 feet wider than the width of the house quadrupled. If the area of the house is 1500 square feet, what is the area of the land?

14. Perform the following arithmetic in base 6. You may use standard algorithms for addition and multiplication.

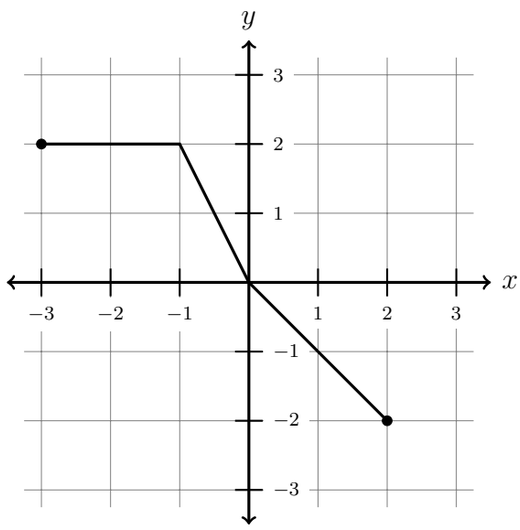
    (a) (3 points) $15,424_6 + 45,324_6$

    (b) (3 points) $42,315,442_6 \times 13_6$

15. Consider the functions, f and g whose graphs are given below.

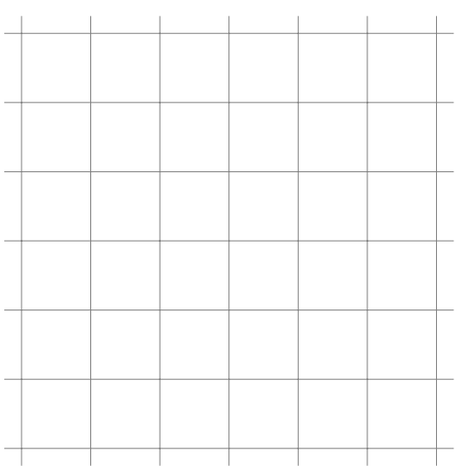


$y = f(x)$



$y = g(x)$

(a) (5 points) Sketch the graph for $y = (f + g)(x)$. Remember to place and scale the axes appropriately.



(b) (2 points) Evaluate $(f \circ g)(-1)$