Bishop's University

Math 190: Final Exam
Winter 2016

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.
- A **Casio fx260-solar** calculator is permitted.

Page	Points	Score
2	25	
3	30	
4	25	
5	20	
6	15	
7	15	
8	25	
9	10	
Total:	165	

1. (5 points) Rationalize the denominator of $\dfrac{7}{\sqrt{11}-5}$.

2. 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) (5 points) $\dfrac{(3x^2yz^{-1})^3}{18y^2z}$

   (b) (5 points) $\sqrt[3]{8x}+\sqrt[3]{-27x}$

   (c) (5 points) $\dfrac{2y+1}{2y-1}+\dfrac{y-2}{y+1}$

   (d) (5 points) $\dfrac{\left(\dfrac{x-1}{x+1}\right)}{\left(\dfrac{x+2}{x^2-1}\right)}$

3. (5 points) Write 1432_8 in base 6.

4. (5 points) Write 140432_5 in base 10.

5. (5 points) Multiply 312_6 and 543_6, writing the answer in base 6. You may use the standard algorithms.

6. Expand the following and simplify (remove brackets and combine like terms)
   (a) (5 points) $(2q - 3r)(5r - 7q)$

   (b) (5 points) $x^3(1 - x)^3$

   (c) (5 points) $(-4m + 3n - 2)^2$

7. Completely factor the following

   (a) (5 points) $3k^5 - 75k^3$

   (b) (5 points) $t^2 + t - 42$

   (c) (5 points) $125x^3 + 8$

   (d) (5 points) Completely factor and simplify $x^4 - 7x^2 - 144$

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

9. Solve

   (a) (5 points) $7t + 12 = 4t - 21$

   (b) (5 points) $4x^2 + 13x - 12 = 0$

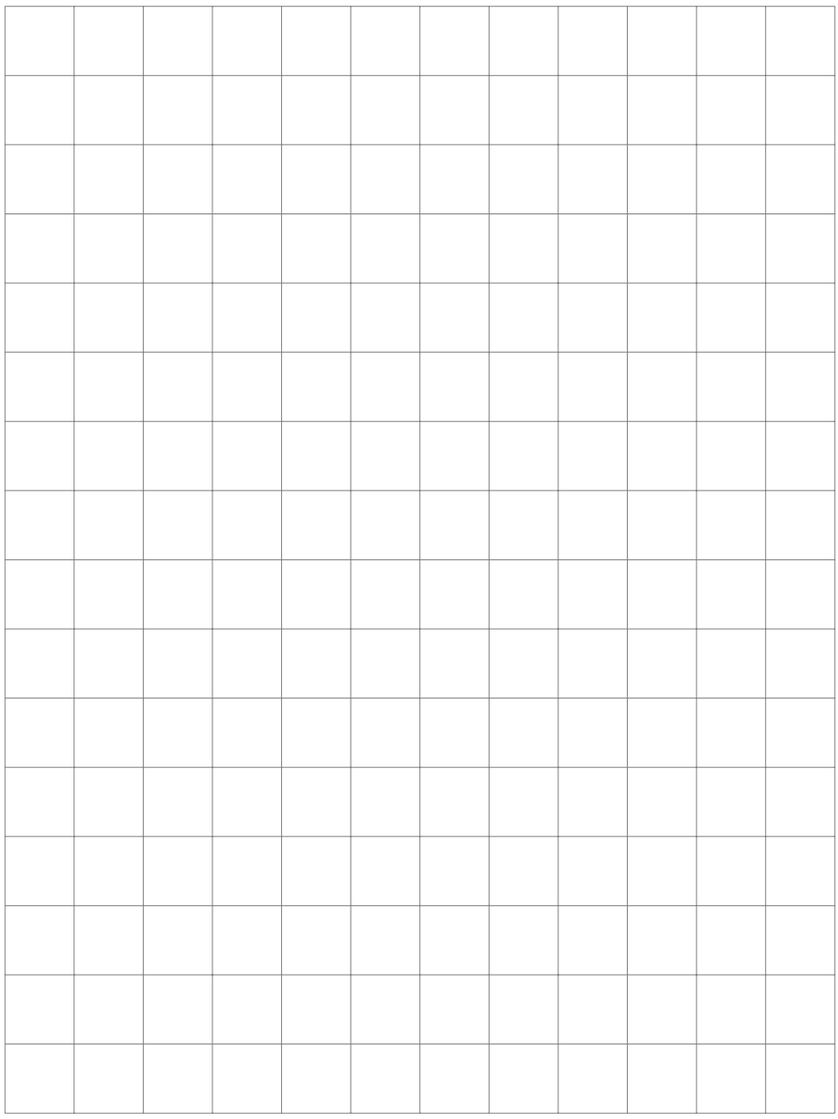
10. Solve, and sketch the answer on the real number line.

   (a) (5 points) $9 - 2w \leq -39$

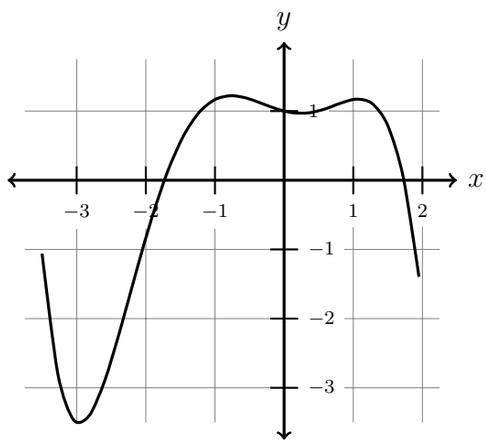
   (b) (5 points) $\dfrac{2x - 6}{x + 7} > x$

11. (15 points) Fill in the table of values for $f(x) = -\frac{1}{16}x^4 - \frac{1}{8}x^3 + x^2 + 2x + 1$ and plot the graph of f. Remember to properly place and scale the axes.

x	-4	-3	-2	-1	0	1	2	3	4
$f(x)$									



12. (10 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)

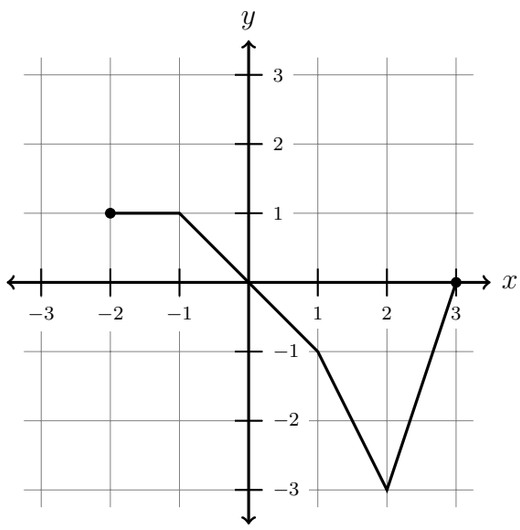
(c) The degree of p must be at least _____.

(d) The value of $p(0)$ is _____.

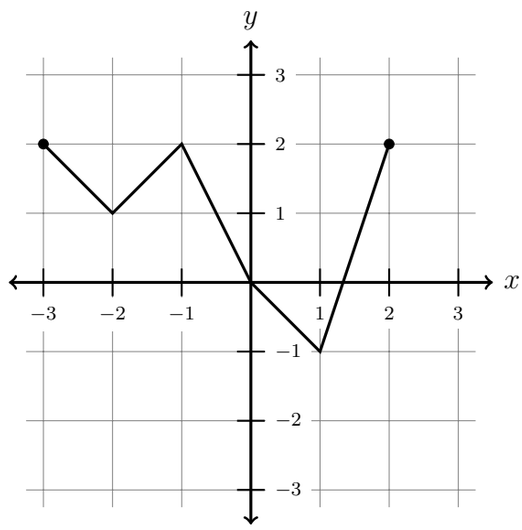
(e) The number of solutions of $p(x) = -2$ is _____.

13. (5 points) A rectangular house is located on a rectangular piece of land. The length of the house is 30 feet more than half of its width. The length of the plot of land is 32 feet shorter than the perimeter of the house, and the land is 2 feet wider than the width of the house doubled. If the perimeter of the land is 300 feet, what is the area of the house?

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



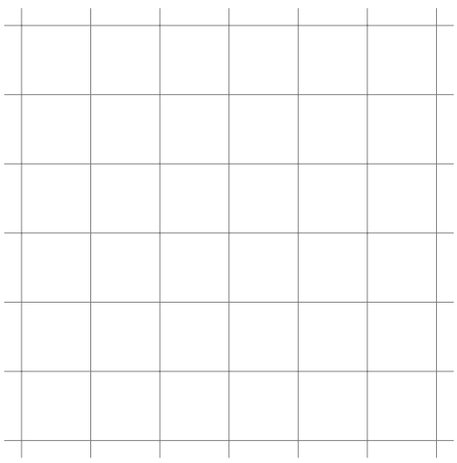
$y = f(x)$



$y = g(x)$

(a) (5 points) Write the domain of $f + g$ using interval notation,

(b) (10 points) Sketch the graph for $y = (f + g)(x)$. Use at least five points and remember to place and scale the axes appropriately.



(c) (10 points) Complete the following table of values. If a value is not in the domain, write **DNE**.

x	-3	-2	-1	0	1	2
$(f \circ g)(x)$						

15. (10 points) Let $f(x) = \dfrac{3x+1}{2x-5}$. Find f^{-1} and state its domain.