Bishop's University

Math 190: Final Exam
Fall 2013

Name: _____

Student #: _____

Time: 3 hours

- 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.
- Do not remove any pages from this test.
- The back of each page may be used for scrap paper.

Page	Points	Score
2	18	
3	15	
4	17	
5	11	
6	21	
7	13	
8	5	
Total:	100	

1. Expand and simplify the following expressions, making sure to remove all brackets, combine like terms and avoid negative and fractional exponents:

   (a) (3 points) $(x+7)(7x-1)$

   (b) (3 points) $(2\sqrt{n}+1)(\sqrt{n}-3)$

   (c) (3 points) $(q^2+2q+2)(q^2-2q+2)$

2. Factor completely the following expressions, making sure to avoid negative and fractional exponents:

   (a) (3 points) $3a^3b-2a^2b^4$

   (b) (3 points) k^2-9

   (c) (3 points) x^3-14x^2+48x

3. Write as a single fraction and simplify the following expressions, making sure to remove all brackets, combine like terms, cancel common factors, and avoid negative and fractional exponents:

   (a) (3 points) $\dfrac{3x+2}{x-1} + \dfrac{x-1}{x+1}$

   (b) (3 points) $\dfrac{1}{x} + \dfrac{1}{x+1} + \dfrac{1}{x+2}$

   (c) (3 points) $\dfrac{5}{\sqrt{x}+2} + \dfrac{3}{\sqrt{x}-2}$

4. Evaluate the indicated function value.

   (a) (2 points) $f(-2)$ where $f(x) = 3x^2 + 2x - 1$.

   (b) (2 points) $h(3)$ where $h(r) = \dfrac{5r^2 - 3r + 1}{r - 4}$.

   (c) (2 points) $a(7)$ where $a(i) = (-1)^i(3i-1)^2$.

5. (3 points) Evaluate $\dfrac{200!}{198! + 197!}$

6. (3 points) Evaluate $|-3 + |-7|| + 1$.

7. Consider the line $7x + 5y = 105$.
   (a) (2 points) Find the x-intercept and the y-intercept.

   (b) (1 point) Find the slope.

   (c) (2 points) Write the slope-intercept equation for this line.

   (d) (2 points) Find the general form of the equation of the line through the point $(14, -8)$ which is perpendicular to the given line. The coefficient in front of the y must be 7.

8. (4 points) Let $x^2 - y^2 = 100$. Test for symmetry about the x-axis, the y-axis, about the origin, and about the line $y = x$. DO NOT SKETCH THE GRAPH.

9. (6 points) Using the diagram below, identify the following functions:

(a) $y = \left(\frac{3}{2}\right)^x$: _____

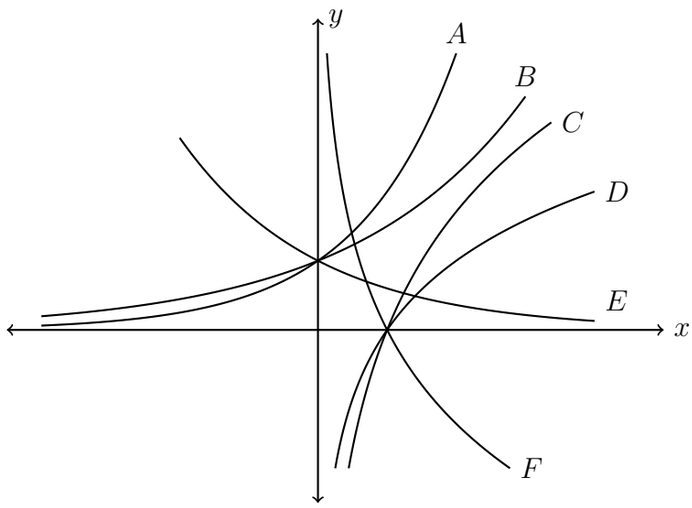
(b) $y = e^x$: _____

(c) $y = \left(\frac{3}{5}\right)^x$: _____

(d) $y = \log_{\frac{1}{2}} x$: _____

(e) $y = \log x$: _____

(f) $y = \log_2 x$: _____



10. (5 points) Graph the function $y = |2x - 4|$ on the graph provided below by first making a table of values with an appropriate number of points, Choose the scale and the placement of the $x-$ and $y-$axes carefully.

11. Solve the following equations:

(a) (3 points) $3x + 15 = 36$

(b) (3 points) $x^2 + 6x = -8$

(c) (3 points) $2x^2 - 5x - 2 = 0$

(d) (3 points) $|2x - 5| = 13$

(e) (3 points) $\sqrt{2x + 3} - 4 = 0$

(f) (3 points) $\sqrt{t} + \sqrt{t + 3} = 3$

(g) (3 points) $2^{2x+1} = \frac{1}{8}$

(h) (3 points) $\log_4(2x+3) = 2$

(i) (3 points) $5^x + 2 \cdot 5^{x+1} = 275$

(j) (3 points) $\log_6(x+4) + \log_6(x-1) = 2$

12. (4 points) Let $f(x) = \dfrac{1}{3x+4}$. Find $f^{-1}(x)$.

13. (5 points) A candy company makes a popular chocolate bar. The rectangular shaped bar is 10cm long, 5cm wide and 2cm thick. Since the price of chocolate has decreased by 45%, the company decided to make a larger chocolate bar. The new bar will have the same thickness as the original bar, but the length and the width will each increase by the same amount. If the new bar is to have a 32% larger volume, what will be the length and width of this new bar?