

Math 120: Final Examination

Spring 2013

Total= 70 points. Time= 2 hours.

Instructions:

1. Cell phones and any other electronic devices **must be put off and not within your reach**.
2. Students are expected to respect the Academic Code of Honor.
3. All work must be shown. Answers with no justification are not acceptable.
4. Your work must clearly show the question number and section, for example, 1a.
5. Number your answer sheets, that is, 1 of 3, 2 of 3, etc.
6. Calculators are **not** allowed.
7. Students will not be allowed to enter after the first 30 minutes of the exam or leave in the first 30 minutes of the exam.

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1. Find the x and y intercepts and sketch the following graph using transformations. Show clearly all the intercepts and asymptotes. (6)

$$y = -\log(x + 1) + 2$$

2. Let $f(x) = \frac{1}{x}$, $g(x) = x^2 - 1$ and $h(x) = \frac{1}{x + 1}$. (9)

- (a) Find the product $(g \cdot h)(0)$.
- (b) Find the quotient function $\frac{f}{g}(x)$ and its domain.
- (c) Find the composition $f \circ h(x)$ and its domain.

See back side of sheet for remaining questions

3. Find the zeroes and their multiplicities of the function given below and sketch its graph. (4)

$$f(x) = -(x - 1)^2(x + 1)(x - 3)$$

4. Let $f(x) = 6x^3 + 25x^2 - 24x + 5$. (8)

- (a) Show that -5 is a zero of $f(x)$ and write down the corresponding factorization.
- (b) Write down the list of all possible rational zeroes of $f(x)$.
- (c) Find all the real zeroes of $f(x)$.

5. Answer the following on the graph of $f(x) = \frac{2x^2}{x^2 - 1}$. (12)

- (a) Find the x and y intercepts.
- (b) Find all the horizontal and vertical asymptotes.
- (c) Sketch the graph.
- (d) Find the domain and range of $f(x)$ and write down the intervals where $f(x) > 0$.

6. Find $f^{-1}(x)$ if $f(x) = \frac{x + 3}{x - 1}$. Write down the domains and ranges of f and f^{-1} . (3)

7. Solve the following. (12)

- (a) $\frac{x - 4}{x + 3} > 0$
- (b) $\log(x + 4) - \log(2) = \log(5x + 1)$
- (c) $5^{3x-1} = 125$

8. Find the exact values (no logs in the answer) in the following. (4)

- (a) $\log_3\left(\frac{1}{27}\right)$
- (b) $\log_2\left(\frac{10}{3}\right) + \log_2\left(\frac{3}{5}\right)$

9. Write the equation of the circle given below in standard form and then find its center and radius. (4)

$$x^2 + y^2 + 6x + 2y + 6 = 0$$

10. Sketch the solution of the following system of inequalities. (4)

$$x^2 + y^2 \leq 16$$

$$x + y > 2$$

11. With 10 euros you can buy one chocolate bar and 2 orange bars. With 8 euros you can buy 2 chocolate bars and one orange bar. How much does a chocolate bar cost? (4)