

Math 105 Final Exam May 7, 2008
Chapters P3 – 4.5

Name _____ Instructor name or section # _____

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Given

QF: $ax^2 + bx + c = 0$, then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ Standard form for a circle: $(x - h)^2 + (y - k)^2 = r^2$

midpoint of a line $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$ distance formula $d = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$

point-slope form: $y = m(x - x_1) + y_1$ Standard form for quadratic: $y = a(x - h)^2 + k$ Odd: $f(-x) = -f(x)$

periodic compounding $A = P \left(1 + \frac{r}{n} \right)^{nt}$ continuous compounding $A = Pe^{rt}$ Even: $f(x) = f(-x)$

Properties of logs: $\ln(a \cdot b) = \ln a + \ln b$, $\ln \frac{a}{b} = \ln a - \ln b$, $\ln a^p = p \ln a$

Show All Work for Full Credit!! On all graphs, tic marks are one unit.

New Stuff (Ch 3.6 to 4.5) #1 – 6.

1. (3 pts ea) Find the exact value of the logarithm without using a calculator.

a.) $\log_e(e) =$

b.) $\log_2(4) =$

2. (2 pts ea) Use properties of logarithms to expand (a, b, c) or condense (d, e) the logarithmic expression as much as possible, evaluating when possible. Do NOT solve for x or y.

a.) $\ln(e^{9x})$

b.) $\ln\left(\frac{e^4}{8}\right)$

c.) $\ln(7x)$

d.) $\log(2x + 5) - \log(x)$

e.) $3\ln(x) - \frac{1}{3}\ln(y)$

3. (3 pts ea) Solve for x. Express the answer to 2 decimals or in terms of logarithms or exponentials.

a.) $\log_4(x + 5) = 2$

b.) $3e^{5x} = 9$

4. (4 pts) An ancient MA105 exam was found in a cave along the Yellowstone River. There were originally 625 problems on it but they were decaying according to the model $A = A_0 e^{-0.0121t}$. If there were 5 problems left, how long was the exam in the cave?

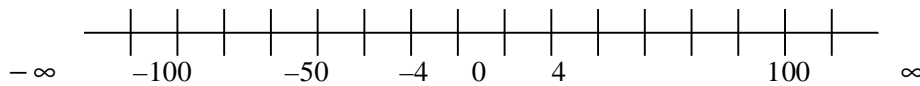
5. (3 pts ea) If the logistic growth function for people sick of snow is $f(t) = \frac{100,000}{1 + 5000e^{-t}}$.

a. How many people were sick of snow at $t = 10$? _____

b. What is the limiting size of the number of people sick of snow? _____

6. (4 pts ea) Express the solution in interval notation by following the instructions.

a. $(x - 4)(x + 100) > 0$ Use the 2 solutions to the equality to mark boundary points on the number line.



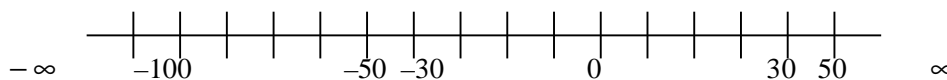
Use your 2 boundary points and the number line to write three intervals.

Pick a test point in each interval and find the function value at that test point:

Test Point	Function value

Express the solution in interval notation.

b. $\frac{(x - 30)}{(x + 50)} < 0$ Use the solutions and vertical asymptotes to mark boundary points on the number line.



Use your 2 boundary points and the number line to write three intervals.

Pick a test point in each interval and find the function value at that test point:

Test Point	Function value

Express the solution in interval notation.

7. (2 pts ea) a. Find function values assuming tic marks are one unit.

$f(-3) =$ _____

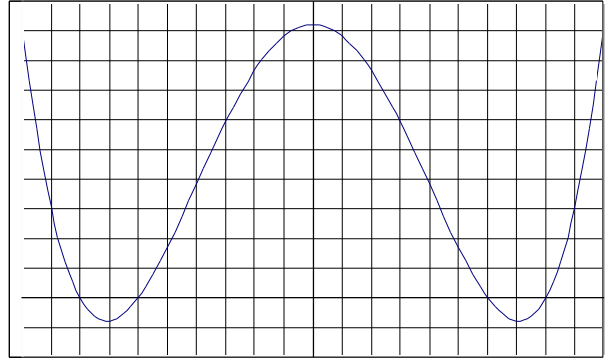
$f(-6) =$ _____

For what value(s) of x is $f(x) = 6$? _____

b. Intervals on which f is increasing: _____

Intervals on which $f \leq 0$: _____

Numbers at which f is a relative min: _____



8. (4 pts) Find and simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$, $h \neq 0$ for $f(x) = x^2 - 1$

9. (2 pts ea) Given $g(x) = x^3 - x^2$

a. $g(-x) =$ _____

b. $-g(x) =$ _____

c. Is this function odd, even or neither? _____

10. (2 pts ea) Use the given conditions to write an equation for the line in point-slope form and slope-intercept form:

Passing through (1, 1) perpendicular to $y = -2x + 1$

Point-slope form: _____

Slope-intercept form: _____

11. (3 pts ea) Factor completely. Do NOT try to solve for x .

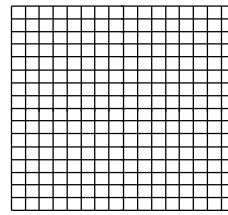
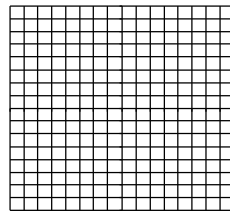
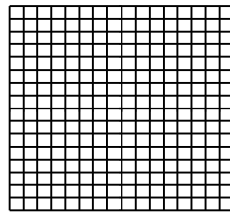
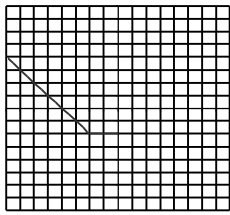
a. $3x^3 - 12x$

b. $2x^2 - 8x + 6$

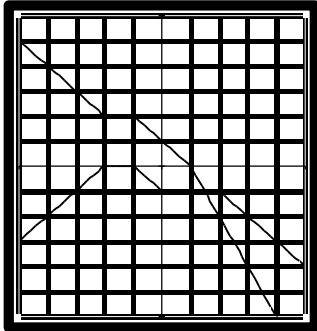
c. $x^3 + 2x^2 - 3x - 6$

d. $x^3 - 2x^2 - 3x$

12 (2 pts ea) Use the graph of $y = f(x)$ below to graph the following functions. Tic marks are one unit.



13. (2 pts ea) Use the graph of f (top) and g (bottom) to evaluate the functions below. Tic marks are one unit.



a. $(f \cdot g)(0) = \underline{\hspace{2cm}}$

b. $(g - f)(-4) = \underline{\hspace{2cm}}$

c. $\left(\frac{f}{g}\right)(2) = \underline{\hspace{2cm}}$

d. $(f \circ g)(-1) = \underline{\hspace{2cm}}$

14. (3 pts ea) Find all values of x satisfying the following conditions. Describe any restrictions on the variable.

a. $f(x) = \frac{2x}{3}$ and $g(x) = x$ and $(f - g)(x) = -2$

b. $1 - \frac{2}{x} = \frac{x-2}{x^2}$

15. The endpoints of a diameter of a circle are $(-4, 2)$, $(6, -4)$.

a. (2 pts) Find the diameter of the circle.

b. (2 pts) Find the center of the circle.

c. (3 pts) Complete the square and write the equation of this new circle if $x^2 + y^2 - 4y + 3 = 0$

16. (4 pts) Given that $h(x) = (f \circ g)(x)$. Identify f and g when $h(x) = \sqrt[3]{x^2 - 9}$

$f(x) = \underline{\hspace{2cm}}$ $g(x) = \underline{\hspace{2cm}}$

17. (3 pts ea) Solve the following equations. Check all solutions.

a. $2x^3 - 8x = 0$

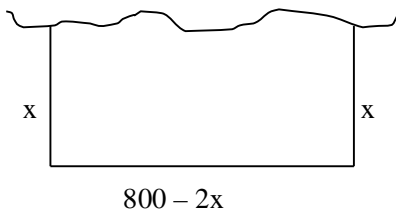
b. $6x^{5/2} - 12 = 0$

Use interval notation to express the solution set.

c. $-9x \geq 36$

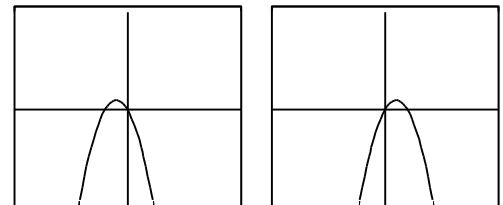
d. $|3x - 8| > 7$

18. (3 pts) You have 800 feet of snail fencing to enclose a rectangular plot of land that borders a salt mine. Since your snails fear salt you don't need a fence there. Find the width (x) of the plot to maximize the area. Show an equation. Guess and check will get you no points.



19. (3 pts) a. If $f(x) = -25(x + 2)^2 + 1$, find x-value of the min or max point.

b. Circle the most likely graph



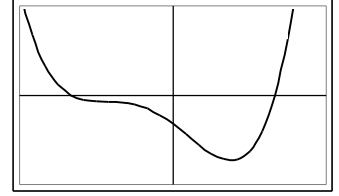
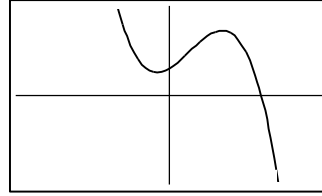
20. (3 pts ea) Match each graph to one function below

a. $m(x) = -x^4 - 4x^3 + 12x^2 + 64x + 96$

b. $g(x) = 100x^3 - 200x^2 - 200x - 300$

c. $h(x) = x^4 + 4x^3 - 12x^2 - 64x - 96$

d. $f(x) = -100x^3 + 200x^2 + 200x + 300$



21. (5 pts) Given $f(x) = 4x^3(x + 1)^2(x - 1)$

a.) What are the zeros? _____

b.) At which zero/s does the graph cross the x-axis? _____

c.) Which zero/s cause the graph to touch and turn? _____

22. (4 pts) Use **division** and the remainder theorem to find $f(4)$ for $f(x) = 2x^3 - 11x^2 + 7x - 5$.

23. (2 pts ea) Given $f(x) = \frac{x^2 + x - 2}{x^2 - 4}$ Identify the following:

a. x-intercept(s), if any: $x =$ _____,

b. y-intercept(s), if any: $y =$ _____

c. vertical asymptote(s) if any, $x =$ _____

d. horizontal asymptote(s) if any, $y =$ _____