Practice Problems for Midterm 2

1) For the following functions, find: (a)the values where the graph crosses the *x*-axis; (b) the value where the graph crosses the *y*-axis; (c) the domain; and (d) the value that the function approaches when *x* gets very large (if there is no value, then write "DNE").

- $y = \dfrac{x^2 - 7x + 12}{x^2 - 1}$
- $y = \dfrac{2x^3 - 6x^2}{x^2 - 4x + 3}$
- $y = \dfrac{3x - 5}{x^2 - 8x + 7}$
- $y = \dfrac{4x^2 - 8x - 32}{x^2 + 4}$

2) Find the quotient using polynomial division for each of the following functions:

- $\dfrac{x^4 - 7x^3 + 14x^2 - 5x - 3}{x - 3}$
- $\dfrac{2x^4 + 13x^3 + 17x^2 - 14x - 8}{x + 4}$
- $\dfrac{8x^4 + 8x^3 - 24x^2 + 5x - 25}{2x + 5}$
- $\dfrac{x^5 - 10x^4 + 22x^3 - 16x^2 + 11x - 6}{x - 2}$

3) Find the equation of the following lines:

- through the points $(5,2)$ and $(8,-4)$
- through the points $(-6,4)$ and $(1,-5)$
- through the points $(8,11)$ and $(-6,7)$
- through the points $(2,-8)$ and $(8,-4)$

4) Find the equation of the following circles:

- center at $(5,-6)$ and radius of 7
- center at $(-4,9)$ and radius of 11
- center at $(-3,-10)$ and radius of 5
- center at $(8,-5)$ and radius of 9

5) Solve for *x*:

- $4^{x-2} = 8^{3-x}$
- $5^{2x+3} = 25^{4x+1}$
- $27^{4-x} = 81^{2+5x}$
- $6^{x+3} = 12$
- $3^{x+5} = 20$
- $2^{3x+1} = 6^{x}$

6) Solve for x:

- $\log_3(4x+1)=2$
- $\log_5(57-4x)=3$
- $\log_4(2x+1)=-1$
- $\ln(x-5)=2$
- $\ln(3x-2)=4$

7) Solve for x:

- $\log_3(4x-6)-\log_3(x+1)=2$
- $\log_2(5x+12)-\log_2(x-3)=3$
- $\log_7(x-3)+\log_7(x+1)=\log_7(5)$
- $\log_5(x+12)+\log_5(x-12)=2$

8) Write as a single logarithm:

- $3\log A+5\log B-2\log C$
- $5\log x+4\log y-\frac{1}{3}\log z$
- $\log x-4\log y+3\log z-2\log w$
- $\frac{1}{2}\ln A+\frac{1}{3}\ln B-\frac{1}{4}\ln C$

9) Expand the following logarithms:

- $\ln\left(\frac{x^2y^3}{z^5}\right)$
- $\log_8\left(\frac{3x^5}{\sqrt{y}}\right)$
- $\log\left(\frac{x\sqrt[4]{y^3}}{z^2}\right)$
- $\log_9\left(\frac{xy^7}{z^2w}\right)$

10) Find $f^{-1}(x)$ if

- $f(x)=\log_6(2x+1)-3$
- $f(x)=3\ln(7x)-4$
- $f(x)=8^{4x-5}+1$
- $f(x)=6e^{1-5x}$

11) Find $(f\circ g)(x)$ if

- $f(x)=2x^3-1$ and $g(x)=\log_4 16$
- $f(x)=\log_6(x-2)$ and $g(x)=x^4-5$
- $f(x)=4\log_5(x)-2$ and $g(x)=5^{x-3}$
- $f(x)=4\log_5(x)-2$ and $g(x)=5^{x-3}$
- $f(x)=\log_2(3x+5)$ and $g(x)=\frac{2^x-5}{3}$

12)

- If you invest $1000 for five years at 8% interest, compounded continuously, how much will you have?

- If you initially have 200 grams of an element and five hours later you have 160 grams, what is its half-life?

- If you initially have 200 grams of an element and three days later you have 180 grams, how much will you have after a week?

- Moss is growing on a rolling stone. Initially, 5% of the stone is covered with moss. After 10 days, 8% of the stone is covered with moss. What percent of the stone will be covered with moss after 24 days?