Math 112

Final Next Wed @ 9am (Dec 8th)

We have had 5 exams.

Final = Exam1 + Exam2 + Exam3 + Exam4 + Exam5
(pick 4) (pick 4) (pick 4) (pick 4) (pick 4)

20 probs to get 2 done in 1hr 50 min

Below (X) means not on final

( ) means on final

? means study for final

MATH 112 - PRE-CALCULUS

EXAM 1

1a) Plot the points: (-2,4), (3,1), (-1,-2), (2,-3)

1b) Create a table of values and plot the graph of $y = 3x - 1$

1c) Create a table of values and plot the graph of $y = |x| - 2$

1d) Create a table of values and plot the graph of $y = x^2 + x - 6$

2)) For $f(x) = x^2 - \frac{1}{x+1}$ and $g(x) = 1 - x^2$

a) What is the domain of $f(x)$? What is the domain of $g(x)$?

b) Find $f(1)$ and $g(2)$

c) Find $f(-2) + g(2)$

d) Find $f(x+h)$. Do not simplify your answer.

e) Find $(f+g)(x)$. Write your answer as a rational function and state the domain.

3a) Create individual plots for each of the functions $f(x) = x$, $f(x) = x^2$, $f(x) = x^3$, $f(x) = |x|$, and $f(x) = \frac{1}{x}$.

3b) Write the function that is $f(x) = \frac{1}{x}$ translated one unit to the left and three units up.

3c) Write the function that is $f(x) = x^3$ translated two units to the right and one unit down.

$y = x$ $y = x^3$ $y = \frac{1}{x}$ $y = \cos x$ $y = e^x$ $y = \sec x$

$y = x^2$ $y = |x|$ $y = \sin x$ $y = \tan x$ $y = \ln x$ $x^2 + y^2 = r^2$

4) For each function determine if it is symmetric about the y-axis, origin, or neither.

a) $f(x) = \frac{1}{x^2} + 2$

b) $f(x) = x - x^4$

c) $f(x) = x^3 - x$

$f(-x) = -f(x)$

vs

$f(-x) = f(x)$

5a) Find the equation for a line passing through the point $(-2, 1)$ and is perpendicular to the line $y = 3x + 1$. Write your answer in point-slope form.

5b) Find the equation for a line passing through the points $(1, 1)$ and $(3, 5)$.

pt (x_1, y_1)

slope m

$y - y_1 = m(x - x_1)$ → $y = mx + b$

6a) Solve: $3|x+1|-2=4$

6b) Solve: $|2x+1|=|3-4x|$

7) You have 120 feet of fencing to make a rectangular pen. Find the dimensions of the pen with maximum area.

8a) Solve: $3|x+1|-2>4$

8b) Solve: $x^2+2x \leq x+6$

9) For $f(x)=-2(x-2)^3(x+1)^7(3-x)$ what are the zeros of the function with their multiplicities? What is the lead term? What is the end-point behavior of the graph of $f(x)$?

10) Two zeros of $f(x)=x^4+2x^3-7x^2-20x-12$ are $x=3$ and $x=-1$. Use synthetic division to factor $f(x)$.

11) Use long division to divide $p(x)=x^4-x^3+2x^2-4x-8$ by $d(x)=x^2+4$. Use the result to factor $p(x)$.

one prob on final uses long division

12) One zero of $p(x)=x^4-2x^3+26x^2-50x+25$ is $x=5i$. Use long division to factor $p(x)$.

we add rational, exponential, and log functions to polynomials.

EXAM 2

1) Find the domain and sketch the graph for:

one sketch of rational function.

$$f(x)=\frac{3x}{x^2-4}$$

2) Find the domain and sketch the graph for:

$$f(x)=\frac{(x-2)(x-1)}{(x+1)(x-1)}$$

3) Solve the equation:

$$\frac{1}{x}+\frac{1}{x^2-1}=3$$

4) Solve the equation:

$$\frac{x^3-2x+1}{x-1}=\frac{x-2}{2}$$

Rational eqn's Solve ① factor ② Mult. by common denom. → this is now a poly. eqn

5) Solve the inequality:

$$\frac{x^2-x}{x-2}\geq\frac{6}{x-2}$$

6) For $f(x)=x^2-x$ and $g(x)=x^2+x$ find:

a) $(g\circ f)(3)$

b) $(g\circ f)(x)$ and find its domain

practice bc basically same.

7) For $f(x)=x^2+2x$ and $g(x)=\sqrt{x-2}$ find $(f\circ g)(x)$ and its domain.

8) Verify that the given function is one-to-one and then find its inverse.

$$f(x)=\frac{2x}{1-x}$$

9) Simplify the given expressions:

a) Express the given exponential expression as a single exponential.

$$\frac{3^{x+1}}{3^x}\cdot 9^{x-1}$$

b) Express the given logarithmic expression as a single logarithm.

$$\log(x-2)+\log(x)-\log(x^2-4)+2\log(x+2)$$

10) Solve: $2^{3x}=16^{1-x}$

11) Solve: $\log_7(1-2x)=1-\log_7(3-x)$

12) Solve: $(\log_2(x))^2<2\log_2(x)+3$

11) $\log_7\frac{(1-2x)(3-x)}{7}=1$

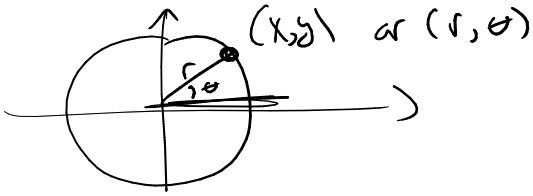
$\rightarrow (1-2x)(3-x)=7^1$

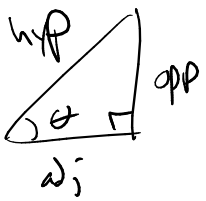
$2^x=3^{x^2-1}$

$\ln(2^x)=\ln(3^{x^2-1})$

$x\ln 2=(x^2-1)\ln 3$

etc





Exam 3

1) Convert the following angles into radians and plot them.

a) $20°$

b) $421°$

c) $-379°$

2) Draw the unit circle with all typical angles, label its points, and create the table of values for $\sin(\theta)$, $\cos(\theta)$, and $\tan(\theta)$ for Quadrant I.

3) Find all angles for the following:

a) $\sin(\theta) = 1/2$

b) $\cos(\theta) = \sqrt{3}/2$

c) $\sin(\theta) = -\sqrt{2}/2$

4) Find the exact value for the following:

a) $\csc(\pi/4)$

b) $\cot(-7\pi/6)$

c) $\cos(14\pi/3)$

d) $\sin(\pi/12)=$

5) Find all angles for the following:

a) $\cot(\theta) = \sqrt{3}/3$

b) $\tan(\theta) = -\sqrt{3}$

c) $\sin(2\theta) = -1/2$

6) Given the following trig funtion find the values of the other five trigonometric functions.

a) $\cos(\theta) = -3/5$ with θ in Quadrant II

b) $\cot(\theta) = \sqrt{5}$ with θ in Quadrant III

7) Simplify the following expressions:

a) $\frac{\csc(\theta)}{1+\cot^2(\theta)}$ and write your answer using only $\sin(\theta)$

b) Verify that $\cos(4\theta) - 4\cos(2\theta) + 3$ simplifies to $8\sin^4(\theta)$

c) Write $\sec^2(\theta)\tan(\theta) - \cot(\theta)$ using only $\sin(\theta)$ and $\cos(\theta)$.

8) Graph: $f(x) = 2\sin(\pi x) + 2$

9) Graph: $f(x) = 3\sec(2\pi x)$

10) Find the exact values:

a) $\arcsin(1/2)$

b) $\arccos(-1/2)$

c) $\arctan(-\sqrt{3})$

11) Find the exact values:

a) $\sin(\arccos(-1/2))$

b) $\cot(\arcsin(12/13))$

12) Solve: $4\sin(x)\cos(x) + 2\sin(x) = 1 + 2\cos(x)$

$\sin(2x) + \sin x = 0$

EXAM 4

1) Standing beside a river you notice a leaf floating on the water is moving up and down with the waves. Assuming that the motion is sinusoidal, find a function for its motion if it takes 2 seconds to go through one oscillation, the river level (when still) is 15 feet, and the range from peak to valley of the motion is 6 inches. Include a drawing for the observations.

Problems 2) to 5) Find all angles and sides to given triangles.

6) Convert the polar coordinates into (x, y) coordinates.

a) $r = 3$ and $\theta = \pi/4$ (find the exact x and y values)

b) $r = 1.2$ and $\theta = 3.01$ (do not find exact x and y values). What quadrant is the point in?

7) Convert the (x, y) coordinates into polar coordinates.

a) $x = 1$ and $y = 3$ (do not find exact values for r and θ)

b) $x = -2$ and $y = 2$ (do not find exact values for r and θ)

8) Solve the system using substitution. Note: You should find the solution (1,2,3).

$$\begin{aligned} x + y - z &= 0 \\ 2x - y + z &= 3 \\ -3x + y + z &= 2 \end{aligned}$$

9) Solve the system using elimination. Note: You should find the solution (1,2,3).

$$\begin{aligned} x + y - z &= 0 \\ 2x - y + z &= 3 \\ -3x + y + z &= 2 \end{aligned}$$

10) Solve the system using an augmented matrix. Note: You should find the solution (1,2,3).

$$\begin{aligned} x + y - z &= 0 \\ 2x - y + z &= 3 \\ -3x + y + z &= 2 \end{aligned}$$

11) Perform the given matrix operations.

$$\begin{pmatrix} -1 & 1 & 0 \\ 2 & 3 & -1 \end{pmatrix}\begin{pmatrix} -1 & 2 \\ 1 & -1 \\ -1 & 1 \end{pmatrix} - 2\begin{pmatrix} 1 & -1 \\ 1 & 0 \end{pmatrix}$$

12) Verify that A and B are inverses by using multiplication.

$$A = \begin{pmatrix} 1 & 2 & -1 \\ 1 & 2 & -2 \\ 2 & 5 & -1 \end{pmatrix} \text{ and } B = \begin{pmatrix} 8 & -3 & -2 \\ -3 & 1 & 1 \\ 1 & -1 & 0 \end{pmatrix}$$