

# M E T U

## Northern Cyprus Campus

Mathematics Proficiency Exam		
Acad. Year: <i>2010-2011</i> Semester : <i>Summer</i> Date : <i>21.6.2011</i> Time : <i>10:00</i> Duration : <i>120 minutes</i>	Last Name: _____ Name : _____ Department: _____ Student No: _____	Signature: _____
	30 QUESTIONS ON 10 PAGES TOTAL 100 POINTS	
		SCORE

Please show your work in all questions.

1.(3 pts) Find the length of the side labelled with  $x$ .

$x =$
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2.(each 1.5 pts)

Convert $\frac{13}{3}\pi$ from radians to degrees.	
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Convert $435^\circ$ from degrees to radians.	
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3.(each 1 pt) Suppose that  $a$ ,  $b$ , and  $c$  denote the sides of a right triangle with angles  $A$ ,  $B$ , and  $C$  opposite  $a$ ,  $b$ , and  $c$  respectively. If  $a = 8$  and  $b = 15$  are the lengths of the two short sides, then

$c =$	
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$\sin(A) =$	
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$\cos(A) =$	
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$\tan(A) =$	
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$\csc(A) =$	
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4. (3 pts) Find an equation of the line through the points  $(2, 1)$ ,  $(4, 0)$ .

5. (3 pts) Write an equation of the circle with center at  $(2, 0)$  and passing through the point  $(0, 1)$ .

6. (3 pts) Given two lines with the equations  $y = 3x + 1$  and  $x + 2y = 1$ , find the intersection point(s) if there is any.

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7.(each 1.5 pts) The difference of Ayşe's and Fatma's money is 30TL.  
One third of Ayşe's money is 6TL more than Fatma's. How much money do they have?

Ayşe has:
Fatma has:

8.(each 1.5 pts) Determine the center and radius of the circle with the equation

$$x^2 - 4x + y^2 - 8y = 0$$

Center:
Radius:

9.(3 pts) Let  $f(x) = \frac{1}{\sqrt{9-x}}$ . Find the domain.

Domain:
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10.(each 1.5 pts) Find the domain and the range of  $f(x) = |3 - 3x| + 1$ .

Domain:
Range:

11.(each 1 pt) For the graph below, state the domain, the range, and the intervals on which the function is increasing, decreasing, or constant.

domain:
range:

incr.:
decr.:
constant:

12.(each 1 pt) Use properties of functions to match of the following functions with their graphs.

1. $f(x) = (x - 2)^2 + 1$	
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2. $f(x) = (x + 2)^2 + 1$	
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3. $f(x) = 1 - (x - 2)^2$	
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4. $f(x) = 1 - (x + 2)^2$	
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**13.**(each 2 pts) Suppose that  $f(x) = \sqrt{4x - 5}$  and  $g(x) = x^2 - 3$ .

For each function  $h$  given below, find a formula for  $h(x)$  and the domain of  $h$ .

a. $h(x) = (f \circ g)(x)$	$h(x) =$	domain:
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b. $h(x) = (g \circ f)(x)$	$h(x) =$	domain:
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**14.**(3 pts) Find a formula for the inverse of the function  $f(x) = \frac{1}{1-x} + 1$ .

$f^{-1}(x):$
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**15.**(3 pts) The radius  $r$ , in centimeters, of a conical cup of height  $h$  is being filled with water. The volume is given by  $V = \frac{1}{3}\pi r^2 h$ . If  $h = 3r$  and  $r = 25 + 2t$ , find a formula  $V = V(t)$ , the volume of the cup as a function of time.

$V(t):$
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16.(3 pts) Find the zeros of  $f(x) = 8x^2 + 32x + 32$ .

$x =$

17.(3 pts) Solve the inequality  $\frac{(x-3)(x+5)}{(x+2)^2} \leq 0$ . State the solution set using interval notation.

18.(3 pts) Solve the inequality  $3x^2 + 5x - 2 < 0$ . State the solution set using interval notation.

19.(3 pts) Find all solutions to the equation  $(x+7) - \frac{2}{(x+7)} = 1$

$x =$

20.(3 pts) Solve the equation  $|2x^2 + 2x + 5| = |6x + 3|$ .

$x =$
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21.(each 1 pt) Evaluate the following expressions.

$\sin\left(\frac{15\pi}{4}\right) =$	
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$\cos\left(\frac{15\pi}{4}\right) =$	
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$\tan\left(\frac{15\pi}{4}\right) =$	
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$\cot\left(\frac{15\pi}{4}\right) =$	
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$\csc\left(\frac{15\pi}{4}\right) =$	
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22.(3 pts) Simplify the expression as much as possible.

$$\frac{\tan(t) + \frac{1}{\tan(t)}}{\sec^2(t)}$$

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23.(each 1.5 pts) Find the exact value of the compositions.

1. $\arctan(2 \sin(\pi/6))$	
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2. $\arccos(\sqrt{2}/2)$	
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24.(each 1.5 pts) According to the graph below, find the length of  $BC$  and the area of the dashed region.

1. $ BC  =$	
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2. $Area =$	
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25.(each 1 pt) Use properties of functions to match each of the following functions with their graphs.

1. $f(x) = \arcsin(x)$	
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2. $f(x) = \sin(10x) - 1$	
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3. $f(x) = \sin(x) - 1$	
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4. $f(x) = 2 \cos(x) $	
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26.(each 1.5 pts) Calculate the following expressions.

a. $(e^7)^{\ln 3} =$	
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b. $\log_{10} \sqrt[3]{100} =$	
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27.(3 pts) Find the domain of the function  $f(x) = \frac{1}{\log_2(x+3)}$

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28.(3 pts) Find the solution to the exponential equation  $3e^{2t} = 5e^t$

$t =$
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29.(3 pts) Find the solution to the equation  $\frac{\ln(e^{4x}) + \ln(e^{x^2})}{4} = -1$

$x =$

30.(each 1 pt) Match each function with its graph

1. $y = e^x$	<input type="text"/>
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2. $y = \log_5(x)$	<input type="text"/>
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3. $y = 2^{-2x}$	<input type="text"/>
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4. $y = 5^x$	<input type="text"/>
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