Prince Sultan University
Department of Mathematics & General Sciences
MATH 002 Major Exam 1
Semester 1, Term 171
Tuesday October 24, 2017

Time allowed: 90 minutes

Student Name: _____ Student ID number:_____

Section: _____   Instructor's Name: _____

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. If your mobile phone is seen or heard, your exam will be taken immediately.
6. You must show all your work beside the problem. Be organized.
7. You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.
8. This examination has 14 problems. Make sure your paper has all these problems.

Problems	Max points	Student's Points
1,2,3,4	18	
5,6,7,8	18	
9,10,11,12	18	
13,14	16	
Total	**70**	
Total	**20**	

1. [4 pts.] Consider the function $f(x) = -4\left(\dfrac{4}{3}\right)^{x-1} + 5$. Find the y-intercept and the equation of the asymptote, if any. **Do not draw the graph!**

2. [6 pts.] Use transformations of the graph of $f(x) = \log_2 x$ to sketch the graph of $f(x) = -2\log_2(x+3) - 2$. Find the **domain, range and the equation of the asymptote.**

3. [4 pts.] Solve the exponential equation $9\left(2^{2x-5}\right) + 2 = 38$

4. [4 pts.] Expand as much as possible the log expression $\ln\sqrt{\dfrac{e^4(x+2)^3}{49x\sqrt{x^2-9}}}$

5. [4 pts.] Condense into a single logarithm $\dfrac{1}{3}\left[\ln(z-5)-\ln y\right]-2\left[\ln\sqrt{x}-2\ln(x+5)\right]$

6. [6 pts.] Find the domain of the following functions:

a) $f(x)=\ln(5-x)$

b) $f(x)=\log_2\left(\dfrac{-x-2}{x+3}\right)$

7. [4 pts.] Solve $e^{4x}-e^{2x}-12=0$
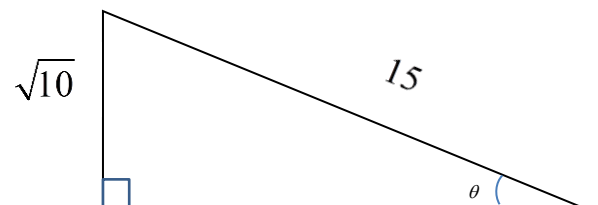
8. [4 pts.] Solve $7^{2-x}=3^{x+1}$

9. [4 pts.] Solve $\log_4(-3+2x) - \log_4(x-3) = \log_4(x+5)$

10. [4 pts.] Find the **arc length** of a segment with radius 15 inches and a central angle of 120°.

11. [4 pts.] A building is 220m tall; it casts a shadow which is 310m long. Find the angle of elevation of the sun at that time.

12. [6 pts.] Find the exact value of all six trig. functions of θ in the given right angled triangle:

13. [4 pts.] If $\cot\theta = \dfrac{11}{5}$ and $\sec\theta < 0$, find the other five trig functions of θ.

14. [12 pts.] Use **reference angles** and a **sketch** to find the exact value of the following. Show your working out and do not use a calculator.

a) $\sec 870°$

b) $\sin\left(\dfrac{7\pi}{6}\right)$

c) $-\cot\left(-300°\right)$