NYC College of Technology
Mathematics Department

Revised Spring 2013
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MAT 1275 Final Exam review sheet

#1 Solve for x (simplify completely):

a) $6x^2-2x-3=0$ b) $2x^2-4x+5=0$ c) $2x^2+2x=-3$

#2 Find the Vertex for each of the following, and then sketch the graph:

a) $y=x^2-2x-3$ b) $y=x^2+2x$ c) $y=-x^2+4x-2$

#3 Simplify the complex fractions: a) $\dfrac{\frac{2}{y^2}+\frac{1}{y}}{\frac{4}{y^2}-\frac{1}{y}}$ b) $\dfrac{\frac{2}{x}+\frac{1}{y}}{\frac{3}{y}-\frac{4}{x}}$ c) $\dfrac{3-\frac{1}{2x}}{2+\frac{1}{x^2}}$

#4 Find the center and radius of each circle, then find four points and sketch the graph:

a) $x^2+y^2-6x+4y-4=0$ b) $x^2+y^2+8x-2y-8=0$ c) $x^2+y^2+10x+6y+18=0$

#5 Perform the indicated operations involving Complex Numbers and express in standard complex form:

a) $(-2+3i)(5-7i)$ b) $(4-9i)(3-2i)$ c) Simplify: $\dfrac{3-2i}{1-i}$ d) Simplify: $\dfrac{2-7i}{3+4i}$

#6 Solve the following system of equations for x, y and z:

a) $\begin{aligned} 3x+2y-z&=4\\ 2x-y+2z&=10\\ x+3y-4z&=-7\end{aligned}$ b) $\begin{aligned} -2x+5y+z&=8\\ x-2y-3z&=-13\\ x+3y-z&=5\end{aligned}$ c) $\begin{aligned} 2x-3y+z&=-9\\ 3x+5y+2z&=16\\ -4x+2y-3z&=4\end{aligned}$

#7 Solve each of the following for x and y:

a) $\begin{aligned} x^2+y^2&=5\\ x-y^2&=-3\end{aligned}$ b) $\begin{aligned} x^2-y^2&=3\\ 2x+y^2&=5\end{aligned}$ c) $\begin{aligned} x^2+y^2&=8\\ x^2-y&=2\end{aligned}$

#8 For the information given, find the values for the five remaining trig functions for θ:

a) $\sin\theta=\frac{2}{5}$ and $\tan\theta>0$ b) $\tan\theta=2$ and $\cos\theta<0$ c) $\csc\theta=-3$ and $\cos\theta>0$

#9 Given each ΔABC, answer each of the following (round each answer to nearest tenth):

a) If a = 12, b = 8 and c = 5. Find $\angle C$

b) If $\angle A=50^\circ$, $\angle B=75^\circ$, a = 20. Find side b.

c) If b = 9, c = 6 and $\angle A=67^\circ$. Find side a.

d) If $\angle C=37^\circ$, $\angle B=79^\circ$, b = 13. Find side a.

#10 Prove each of the following Trig Identities:

a) $\cos x+\sin x\cdot\tan x=\sec x$ b) $\csc x-\sin x=\cot x\cdot\cos x$ c) $\dfrac{1}{\cos x}-\dfrac{1}{\sec x}=\tan x\cdot\sin x$

d) $\csc x\cdot\cot x\cdot\sec x=1+\cot^2 x$ e) $\sin x\cdot\tan x\cdot\cos x=1-\cos^2 x$ f) $\csc x\cdot\sec x=\cot x+\tan x$

#11 Solve the following Equations for x, where $0^\circ \le x < 2\pi$:

a) $4\sin x + 2 = 0$ b) $6\cos x - 3 = 0$ c) $2\tan x - 2 = 0$ d) $6\tan x = -2\sqrt{3}$

#12 Solve to the nearest tenth:

a) $3^x = 38$ b) $2^x = 19$ c) $4^x = 7$ d) $5^x = 29$

#13 Evaluate the following without the use of a calculator:

a) $\log_2 \sqrt[3]{2}$ b) $\log_3 \frac{1}{9}$ c) $\log_4 64$ d) $\log_5 \sqrt{5}$

Answers to questions:

#1 a) $\frac{1\pm\sqrt{19}}{6}$ b) $\frac{2\pm i\sqrt{6}}{2}$ c) $\frac{-1\pm i\sqrt{5}}{2}$

#2 a) Vertex: (1, -4) b) Vertex: (-1, -1) c) Vertex: (2, 2)

#3 a) $\frac{2+y}{4-y}$ b) $\frac{2y+x}{3x-4y}$ c) $\frac{6x^2-x}{4x^2+2}$ or $\frac{x(6x-1)}{2(2x^2+1)}$

#4 a) Center: (3, -2) ; Radius: r = $\sqrt{17}$ b) Center: (-4, 1) ; Radius: r = 5 c) Center: (-5, -3) ; Radius: r = 4

#5 a) $11+29i$ b) $-6-35i$ c) $\frac{5}{2}+\frac{1}{2}i$ d) $-\frac{22}{25}-\frac{29}{25}i$

#6 a) $x=3, y=-2, z=1$ b) $x=3, y=2, z=4$ c) $x=-1, y=3, z=2$

#7 a) (-2, 1), (-2, -1), (1, 2), (1, -2) b) (2, 1), (2, -1), $(-4,\sqrt{13})$, $(-4,-\sqrt{13})$ c) (-2, 2), (2, 2), (i, -3), (-i, -3)

#8 a) $\text{Cos}\theta=\frac{\sqrt{21}}{5}$, $\text{Tan}\theta=\frac{2}{\sqrt{21}}=\frac{2\sqrt{21}}{21}$, $\text{Sec}\theta=\frac{5}{\sqrt{21}}=\frac{5\sqrt{21}}{21}$, $\text{Csc}\theta=\frac{5}{2}$, $\text{Cot}\,\theta=\frac{\sqrt{21}}{2}$

b) $\text{Sin}\theta=-\frac{2}{\sqrt{5}}=-\frac{2\sqrt{5}}{5}$, $\text{Cos}\theta=-\frac{1}{\sqrt{5}}=-\frac{\sqrt{5}}{5}$, $\text{Sec}\theta=-\sqrt{5}$, $\text{Csc}\theta=-\frac{\sqrt{5}}{2}$, $\text{Cot}\theta=\frac{1}{2}$

c) $\text{Sin}\theta=-\frac{1}{3}$, $\text{Cos}\theta=\frac{2\sqrt{2}}{3}$, $\text{Sec}\theta=\frac{3\sqrt{2}}{4}$, $\text{Tan}\theta=-\frac{1}{2\sqrt{2}}$, $\text{Cot}\theta=-2\sqrt{2}$

#9 a) $\angle C=17.6^\circ$ b) $b=25.2$ c) $a=8.6$ d) $a=11.9$

#10 LHS = Left Hand Side. RHS = Right Hand Side.

a) LHS: $\text{Cos}x+\text{Sin}x\cdot\frac{\text{Sin}x}{\text{Cos}x}=\left(\frac{\text{Cos}x}{\text{Cos}x}\right)\text{Cos}x+\frac{\text{Sin}^2x}{\text{Cos}x}=\frac{\text{Cos}^2x+\text{Sin}^2x}{\text{Cos}x}=\frac{1}{\text{Cos}x}=\text{Sec}x$

b) LHS: $\text{Csc}\,x-\text{Sin}\,x=\frac{1}{\text{Sin}x}-\text{Sin}x\left(\frac{\text{Sin}x}{\text{Sin}x}\right)=\frac{1-\text{Sin}^2x}{\text{Sin}x}=\frac{\text{Cos}^2x}{\text{Sin}x}=\frac{\text{Cos}x}{\text{Sin}x}\cdot\text{Cos}x=\text{Cot}x\cdot\text{Cos}x$

c) LHS: $\frac{1}{\text{Cos}x}-\frac{1}{\text{Sec}x}=\frac{1}{\text{Cos}x}-\frac{\text{Cos}x}{1}\left(\frac{\text{Cos}x}{\text{Cos}x}\right)=\frac{1-\text{Cos}^2x}{\text{Cos}x}=\frac{\text{Sin}^2x}{\text{Cos}x}=\frac{\text{Sin}x}{\text{Cos}x}\cdot\text{Sin}x=\text{Tan}x\cdot\text{Sin}\,x$

d) LHS: $\frac{1}{\text{Sin}x}\cdot\frac{\text{Cos}x}{\text{Sin}x}\cdot\frac{1}{\text{Cos}x}=\frac{1}{\text{Sin}^2x}=\text{Csc}^2x=1+Cot^2x$

e) LHS: $\text{Sin}x\cdot\frac{\text{Sin}x}{\text{Cos}x}\cdot\text{Cos}x=\text{Sin}^2x=1-\text{Cos}^2x$

Answers to questions (continued):

f) LHS: $\frac{1}{\sin x} \cdot \frac{1}{\cos x} = \frac{1}{\sin x \cdot \cos x} = \frac{\sin^2 x + \cos^2 x}{\sin x \cdot \cos x} = \frac{\sin^2 x}{\sin x \cdot \cos x} + \frac{\cos^2 x}{\sin x \cdot \cos x} = \frac{\sin x}{\cos x} + \frac{\cos x}{\sin x} = \tan x + \cot x$

#11 a) $x = \frac{7\pi}{6}, \frac{11\pi}{6}$ b) $x = \frac{\pi}{3}, \frac{5\pi}{3}$ c) $x = \frac{\pi}{4}, \frac{5\pi}{4}$ d) $x = \frac{5\pi}{6}, \frac{11\pi}{6}$

#12 a) $x = 3.3$ b) $x = 4.2$ c) $x = 1.4$ d) $x = 2.1$

#13 a) $\frac{1}{3}$ b) -2 c) 3 d) $\frac{1}{2}$