Midterm 3 topics MA 158

This is meant to be a guideline for studying for the exam, not an exhaustive list. The exam coversheet should look familiar at this point. You will be given the following formulas

$x^{3} - y^{3} = (x - y)(x^{2} + xy + y^{2})$	Closed Right Circular Cylinder
$x^{3} + y^{3} = (x + y)(x^{2} - xy + y^{2})$	$V = \pi r^2 h$ $S = 2\pi r h + 2\pi r^2$
Sphere	Closed Right Circular Cone
$V = \frac{4}{3}\pi r^3$ $S = 4\pi r^2$	$V = \frac{1}{3}\pi r^2 h$ $S = \pi r \sqrt{r^2 + h^2} + \pi r^2$
Compound Interest	Pythagorean Identities
$A = P \left(1 + \frac{r}{n}\right)^{nt} A = Pe^{rt}$	$\sin^2 \theta + \cos^2 \theta = 1$

Anything else you think you need should be memorized. In addition to past homework questions and the "Exam 3 Practice Problems," as the Exam 3 memo indicates, you can refer to the following past exam questions via Loncapa:

- (a) Exam 2 Fall 2015 #1,2,4,5,6,7,8,9,10,11,12,14,15
- (b) Exam 3 Fall 2015 #1,2,3,4,5,6,7,11,12
- (c) Exam 2 Spring 2016 #2, 12, 13, 14, 15
- (d) Exam 3 Spring 2016 #1,2,3,4,5,6,7,8,9,10,11,12,13,14,15

Remarks

From Dave Norris (course coordinator):

- 1. The exam does not cover Lesson 31. This will be on the final though.
- 2. The exam is very trig heavy. There is one system of equations and I believe about 3 log/exponential problems and the rest are trig.
- 3. Most things are very basic. I know they had a hard time with those lessons on trig equations, so I tried to keep them very simple and clean. The same is true of the word problems they should concentrate on the basic ones where they have to label the triangle correctly and solve in one step.

You should know...

Lesson 20

- How to convert between $y = b^x$ and $x = \log_b y$
- $-\log_{10} x = \log x, \log_e x = \ln x$
- $-\log a + \log b = \log(ab), \, \log(a^n) = n \log a, \, \log a \log b = \log(a/b)$
- How to solve something like $e^{2x} 3e^x 18 = 0$

Lesson 21

- How to translate a word problem into an exponential growth or decay equation
- How to find half-life, doubling time, etc.

Lesson 22

- How many degrees, radians in a circle
- How to convert between radians and degrees
- How to convert $DD \triangleright DMS$
- Definitions you should know:
 - A complementary angle
 - A supplemental angle
 - (Acute) reference angle
 - Quadrant I,II,III,IV

Lesson 23

- The Pythagorean Theorem: $a^2 + b^2 = c^2$
- The six trig functions and how they are related
- "SOHCAHTOA"
- In what quadrants each trig function is positive/negative ("ASTC")

Lesson 24

- The special triangles: 45-45-90, 30-60-90
- The trig values for $0, \pi/2, \pi, 3\pi/2$
- The unit circle (at least in QIII)
- Use reference angles to find trig values in other quadrants

Lesson 25

- Definitions you should know:
 - Amplitude
 - Period
- How to graph $y = a\sin(bx)$, $y = a\cos(bx)$, $y = a\tan(bx)$
- How to determine domain, range, positive/negative, increasing/decreasing for all 3 of these functions
- Given a graph, determine what trig function is graphed, its amplitude, period, etc.

Lesson 26

- How to find the acute angle θ (in radians, DD or DMS) such that trig θ = something
- Find all angles θ in $[0, 2\pi)$ (or in $[0, 360^{\circ})$) such that trig θ = whatever, especially involving our "special" angles

Lesson 27

- How to solve trig equations (for x in the interval $[0, 2\pi)$), for example:
 - $-2\sin x 1 = 0$
 - $-4\tan x + 4\sqrt{3} = 0$
 - $-8\sin^2 8 = 0$
 - $-2\sin x\cos x \sin x = 0$
 - $-\sec^2 \sec x 2 = 0$

Lesson 28

- How to use the Pythagorean identity $\cos^2 \theta + \sin^2 \theta = 1$
- How to solve something like $\sin x + 1 = 2\cos^2 x$ or $\cot^2 x \cot x = 0$
- How to solve things like $2\cos(3x) \sqrt{3} = 0$ or $\sqrt{3}\tan(\frac{1}{3}x) = 1$
- Given a solution in $[0, 2\pi)$ how to find the general solution in any of the types of scenarios mentioned

Lesson 29

- Angle of elevation, angle of depression
- How to read a word problem and translate it into a picture

Lesson 30

- The substitution and elimination method for solving linear equations
- In the context of a linear system, what it means to be consistent/inconsistent, dependent/independent
- How to solve a simple non-linear system using substitution
- Given a word problem, determine the variables and create a system of equations to solve