

FALL SEMESTER FINAL EXAM STUDY GUIDE - PART THREE

PRECALCULUS

Name: _____

KEY

****Note:** Questions on this study guide are not exact replicas of what will be on the final - the concepts covered on this study guide will be on the final, however**

3.1 - Exponential Functions

Analyze the graph of each function. Describe its domain, range, intercepts, asymptotes, end behavior, and where the function is increasing/decreasing.

What's the Compound Interest Formula, and what does each variable represent?

$$A = P(1 + \frac{r}{n})^{nt}$$

P = starting amount, r = rate (decimal)
 n = how its being compounded t = time (years)

What's the Continuous Compound Interest Formula, and what does each variable represent?

$$A = Pe^{rt}$$

P = starting amount r = rate (decimal)
 $e = 2.7$ t = time (years)

Given $P = \$5000$, $r = 6\%$, and $t = 30$, complete the table below to find the value of an investment A .

n	1	4	12	365	continuously
A	28717.45	29846.61	30112.88	30243.76	30248.23

****remember to review what n will equal when the interest is being compounded annually, semiannually, daily, etc.****

3.2 - Logarithmic Functions

Rewrite each expression into exponential form. ****Remember, by doing this it might make it easier to solve!****

1) $\log_2 8$ 3 2) $\log_2 2^3$ 3 3) $\ln e^{-14}$ -14 4) $\log_3 42$ 3.4

Evaluate each expression.

5) $\ln(-6)$ \emptyset 6) $3\ln e^4$ 12 7) $\ln(5 - \sqrt{6})$ 0.94 8) $\log_3 635$ 5.87

3.3 - Properties of Logarithms

What's the Product Property? $\log_b x + \log_b y = \log_b xy$

What's the Quotient Property? $\log_b x - \log_b y = \log_b \frac{x}{y}$

What's the Power Property? $\log_b x^m = m \cdot \log_b x$

Express each logarithm in terms of $\log 5$ and $\log 3$

1) $\log 75$

$$\log 25 + \log 3$$

$$2\log 5 + \log 3$$

Expand each expression.

3) $\log(12x^6y^3)$

$$\log 12 + 6\log x + 3\log y$$

Condense each expression.

5) $3\log_5 x - 1/2\log_5(6-x)$

$$\log_5 \frac{x^3}{\sqrt{6-x}}$$

2) $\log 5.4 = \log 27/5$

$$\log 27 - \log 5$$

$$3\log 3 - \log 5$$

4) $\ln\left(\frac{x^2}{\sqrt{4x+1}}\right)$

$$2\ln x - \frac{1}{2}\ln(4x+1)$$

6) $7\log_3 a + \log_3 b - 2\log_3(8c)$

$$\log_3 \frac{a^7 b}{(8c)^2}$$

3.4 - Exponential and Logarithmic Equations

Solve each equation.

1) $\log_4 x = \log_4 3 + \log_4(x-2)$

$$x = 3x - 6$$

$$-2x = -6$$

$$x = 3$$

3) $6^{2x+4} = 5^{-x+1}$

$$(2x+4)\ln 6 = (-x+1)\ln 5$$

$$1.8(2x+4) = 1.6(-x+1)$$

$$3.6x + 7.2 = -1.6x + 1.6$$

$$5.2x = -5.6$$

$$x = -1.07$$

5) $\ln(7x+3) - \ln(x+1) = \ln(2x)$

$$\frac{7x+3}{x+1} = 2x$$

$$7x+3 = 2x^2 + 2x$$

$$0 = 2x^2 - 5x - 3$$

$$x = 3$$

$$x = -1/2$$

2) $8^y = 0.165$

$$\log_8(0.165)$$

$$y = -0.86$$

4) $4e^{4x} + 8e^{2x} = 5$

$$4e^{4x} + 8e^{2x} - 5 = 0$$

$$4m^2 + 8m - 5 = 0$$

$$(2m-1)(2m+5) = 0$$

$$m = 1/2 \quad m = -5/2$$

6) $\log_9(x^2 - 3) = \log_9 13$

$$x^2 - 3 = 13$$

$$x^2 = 16$$

$$x = \pm 4$$

$$m = e^{2x}$$

$$\ln 1/2 = 2x$$

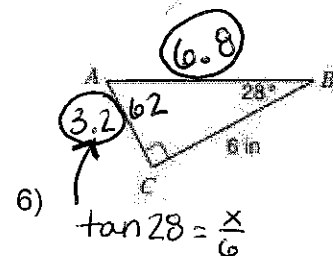
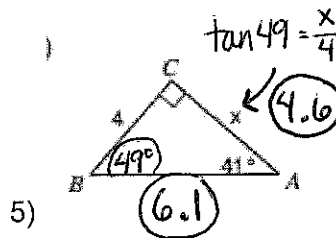
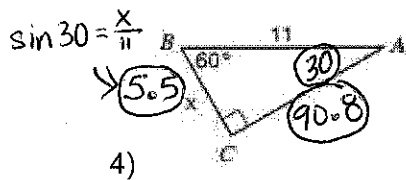
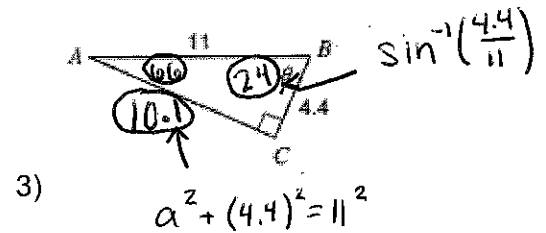
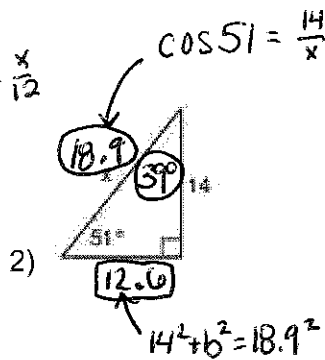
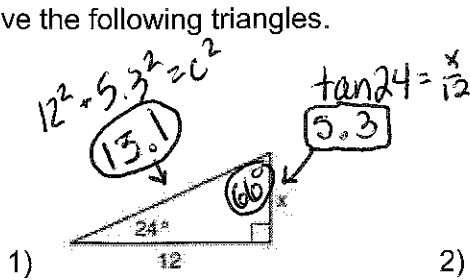
$$-0.34 = x$$

3.5 - Modeling with Nonlinear Regression

There will be a question or two from this section on your final -- review your notes, homework, and test!

4.1 - Right Triangle Trigonometry

Solve the following triangles.



7) Define the six trigonometric functions.

$$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$$

$$\csc(\theta) = \frac{\text{hyp}}{\text{opp}}$$

$$\sec(\theta) = \frac{\text{hyp}}{\text{adj}}$$

$$\tan(\theta) = \frac{\text{adj}}{\text{opp}}$$

8) The inverses of the trigonometric functions are used to find angle measures.

4.2 - Degrees and Radians

1) How do you convert degrees to radians? Multiply $\pi/180$

2) How do you convert radians to degrees? Multiply $180/\pi$

3) What is the formula for arc length, and what do the variables represent?

$s = \theta r$; θ = angle measure (radians), r = radius, s = intercepting arc length

4) What is the formula for the area of a sector, and what do the variables represent?

$A = \frac{1}{2} \theta r^2$; θ = angle measure (radians), r = radius, A = Area of sector

5) Convert the following to radians/degrees.

a) 30° $\pi/6$

b) -165° $-11\pi/12$

c) $2\pi/3$ 120°

d) $-7\pi/6$ -210°

6) How do you find coterminal angles? $\pm 360^\circ$, $\pm 2\pi$ radians

$$s = r\theta$$

7) Find the length of the arc with the given central angle with given radius. Round to the nearest tenth.

a) $\pi/6, r = 2.5$

1.31

b) $150^\circ, r = 79$

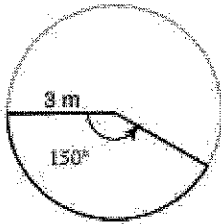
206.82

c) $45^\circ, r = 5$

3.93

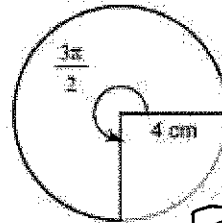
8) Find the area of each sector.

$$A = \frac{1}{2}r^2\theta$$



11.78

a)



37.70

b)

4.4 - Graphing Sine and Cosine Functions

1) Given $y = a\sin(bx + c) + d$ and $y = a\cos(bx + c) + d$, how do you find the amplitude, phase shift, period, vertical shift, frequency, and midline?

amplitude: $|a|$

frequency: $1/\text{period}$

phase shift: $-c/|b|$

period: $2\pi/|b|$

vertical shift: d

midline: $y = d$

2) Using what you found in #1, analyze the following cosine and sine functions.

a) $y = \sin(x + 5\pi/6) + 4$

b) $y = -0.25\cos(2x) - 5$

amp: 1

midline: $y = 4$

amplitude: $1/4$

midline: $y = -5$

period: 2π

PS: $-5\pi/6$

period: π

PS: 0

freq: $1/2\pi$

frequency: $1/\pi$

VS: 4

VS: -5

4.7 - Law of Sines and Cosines

1) What is the Law of Sines?

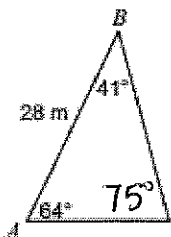
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

2) What is the Law of Cosines?

$$a^2 = b^2 + c^2 - 2bc \cos(A)$$

3) Solve the following triangles.

5)



$$\frac{\sin 75}{28} = \frac{\sin 41}{b}$$

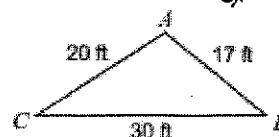
$$b \cdot \sin 75 = 28 \cdot \sin 41$$

$b = 19$

$$\frac{\sin 75}{28} = \frac{\sin 64}{a}$$

$a = 26$

6)



$$30^2 = 20^2 + 17^2 - 2(20)(17) \cos A$$

$$900 = 689 - 680 \cos A$$

$$211 = -680 \cos A$$

$$-0.31 = \cos A$$

$108^\circ = A$

$$\frac{\sin 108}{30} = \frac{\sin B}{20}$$

$39^\circ = B$

$C = 33^\circ$