MATH:1460 Quiz #2 Study Guide

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University of Iowa — September 3, 2021

Below is a list of material to know for Quiz #2. Notes can be found under Files in the lecture's ICON module. For clarity of any topic, please refer to the book (found in MyLab). You can also email me.

Week 2 Material

(i) Section 1.2

(a) Summation notation

(b) Least squares lines (formula will be attached in the test)

(ii) Section 1.3

(a) Properties of functions

(b) Determine whether a relation defines a function

(c) Vertical line test

(d) Find the domain and range of a given function

(e) Evaluate a function

(f) Composition of functions

(iii) Section 1.4

(a) Find vertex of quadratic function and graph the quadratic function

(b) Solve quadratic equation

Practice problems

Please see pages 65-66 of book (available on MyLab).

MATH:1460 Quiz #4 Study Guide

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Below is a list of material to know for Quiz #4. Notes can be found under Files in the lecture's ICON module. For clarity of any topic, please refer to the book (found in MyLab). You can also email me.

Week 4 Material

(1) Section 2.2

   (i) Solve log equationsSimplify log by using the rules;

   (ii) Change base formula.

(2) Section 2.3

   (i) Application problem on exponential growth and decay functions (such as yeast production, decay of radioactive substances);

(3) Section 2.4

   (i) Transition between radian measure and degree measure;

   (ii) Trig functions in a right triangle;

   (iii) The value of trig functions on general real radian measure (you can figure out by looking for the reference point in first quadrant);

   (iv) Know how to graph a trig function;

   (v) Know how to calculate the amplitude and the period of a general trig function.

Practice problems

The following problems are from sections 2.2 - 2.4.

(1) Write each exponential equation in logarithmic form:

(a) $5^3 = 125$

(b) $2^7 = 128$

(c) $(\frac{5}{4})^{-2} = \frac{16}{25}$

(2) Solve each equation:

(a) $\log_x 36 = -2$

(b) $\log_9 27 = m$

(c) $\log_3(x^2 + 17) - \log_3(x + 5) = 1$

(3) 500 g of iodine-131 is decaying exponentially. After 3 days 386 g of iodine-131 is left.

(a) Write in the form $y = y_0 e^{kt}$ giving the number of grams of iodine-131 after t days.

(b) Write the function from part **a** in the form $y = y_0(386/500)^{f(t)}$.

(c) Use your answer from part **a** to find the half-life of iodine-131.

(4) A group of Tasmanian botanists have claimed that a King's holly shrub, the only one of its species in the world, is also the oldest living plant. Using carbon-14 dating of charcoal found along with fossilized leaf fragments, they arrived at an age of $43,000$ years for the plant, whose exact location in south-west Tasmania is being kept a secret. What percent of the original carbon-14 in the charcoal was present?

(5) Complete the following table. Use the $30° - -60° - -90°$ and $45° - -45° - -90°$ triangles. Do not use a calculator.

θ	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\cot\theta$	$\sec\theta$	$\csc\theta$
30°	1/2	$\sqrt{3}/2$			$2\sqrt{3}/3$	
45°			1	1		
60°		1/2	$\sqrt{3}$		2	
120°	$\sqrt{3}/2$		$-\sqrt{3}$			$2\sqrt{3}/3$
135°	$\sqrt{2}/2$	$-\sqrt{2}/2$			$-\sqrt{2}$	$\sqrt{2}$
150°		$-\sqrt{3}/2$	$-\sqrt{3}/3$			2
210°	$-1/2$		$\sqrt{3}/3$	$\sqrt{3}$		-2
240°	$-\sqrt{3}/2$	$-1/2$			-2	$-2\sqrt{3}/3$

(6) Find the amplitude (a) and period (T) of each function. Then graph each function over a two-period interval.

(a) $f(x) = \cos(3x)$

(b) $h(x) = -\frac{1}{2}\sin(4\pi x)$

(c) $g(t) = -2\sin(\frac{\pi}{4}t + 2)$

MATH:1460 Quiz #5 Study Guide

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Below is a list of material to know for Quiz #5. Notes can be found under Files in the lecture's ICON module. For clarity of any topic, please refer to the book (found in MyLab). You can also email me.

Week 4 Material

(1) Section 3.1 - Limits

- (i) One-sided limits
- (ii) Limit of a function
- (iii) Existence of limits
- (iv) Piecewise functions
- (v) Rules for limits
- (vi) Limits at infinity and finding limits at infinity

(2) Section 3.2 - Continuity

- (i) Determine where a function is continuous
- (ii) Determine where a function is discontinuous
- (iii) Removable discontinuity
- (iv) Continuity on an open interval
- (v) Continuity on a closed interval
- (vi) Intermediate value theorem

(3) Section 3.3 - Rates of Change

- (i) Average rate of change
- (ii) Average speed
- (iii) Instantaneous rate of change
- (iv) Velocity

Practice problems

The following problems are from sections 3.1 - 3.3.

(1) Find $\lim_{x\to 2} g(x) = \frac{x^3-2x^2}{x-2}$.

(2) Determine $\lim_{x\to 2} h(x)$ where

$$h(x) = \begin{cases} x^2 & \text{if } x \neq 2 \\ 1 & \text{if } x = 2. \end{cases}$$

(3) Find $\lim_{x\to -2}$ where

$$f(x) = \frac{3x+2}{2x+4}.$$

(4) Find $\lim_{x\to 0} \frac{|x|}{x}$.

(5) Suppose $\lim_{x\to 2} f(x) = 3$ and $\lim_{x\to 2} g(x) = 4$. Use the limit rules to find the following limits.

(i) $\lim_{x\to 2}[f(x) + 5g(x)]$.

(ii) $\lim_{x\to 2} \frac{[f(x)]^2}{\ln g(x)}$.

(6) Use the properties of limits to help decide whether each limit exists. If a limit exists, find its value.

(i) $\lim_{x\to 3} \frac{x^3-9}{x-3}$

(ii) $\lim_{x\to 0} \frac{1-\cos^2(x)}{\sin^2(x)}$ (Hint: consider trig identities.)

(iii) $\lim_{x\to\infty} \frac{x^2+2x-5}{3x^2+2}$

(iv) $\lim_{x\to\infty} \frac{2x^2-7x^4}{9x^2+5x-6}$

(7) Find all values of x where the function is discontinuous. For each value of x, give the limit of the function at that value of x. Be sure to note when the limit doesn't exist.

(i) $f(x) = \frac{5+x}{x(x-2)}$

(ii) $f(x) = \frac{x^2-25}{x+5}$

(iii) $p(x) = x^2 - 4x + 11$

(iv) $f(x) = \sin(\frac{x}{x+2})$

(v) $j(x) = \ln|\frac{x+2}{x-3}|$

(vi) $g(x) = \tan(\pi x)$

(8) Graph the given function, find all values of x where the function is discontinuous, and find the limit from the left and from the right at any values of x that are discontinuous.

(i)

$$f(x) = \begin{cases} 1 & \text{if } x < 2 \\ x+3 & \text{if } 2 \leq x \leq 4 \\ 7 & \text{if } x > 4 \end{cases}$$

(ii)

$$h(x) = \begin{cases} x^2 + x - 12 & \text{if } x \leq 1 \\ 3 - x & \text{if } x > 1 \end{cases}$$

(9) Find the value of the constant k that makes the function continuous.

(i)

$$g(x) = \begin{cases} \frac{3x^2+2x-8}{x+2} & \text{if } x \neq -2 \\ 3x + k & \text{if } x = -2 \end{cases}$$

(ii)

$$f(x) = \begin{cases} kx^2 & \text{if } x \leq 2 \\ x + k & \text{if } x > 2 \end{cases}$$

(10) Find the average rate of change for each function over the given interval.

(i) $y = -4x^2 - 6$ between $x = 1$ and $x = 3$

(ii) $y = \frac{1}{x-1}$

(iii) $y = \sqrt{x}$ between $x = 1$ and $x = 4$

(iv) $y = \sin x$ between $x = 0$ and $x = \frac{\pi}{4}$

(11) Find the instantaneous rate of change for each function at the given value.

(i) $f(x) = x^2 + 2x$ at $x = 0$

(ii) $s(t) = -4t^2 - 6$ at $t = 2$

(iii) $g(t) = 1 - t^2$ at $t = -1$

(iv) $F(x) = x^3 + 2$ at $x = 0$

(12) If the instantaneous rate of change of $f(x)$ with respect to x is positive when $x = 1$, is f increasing or decreasing there?

(13) Suppose the position of an object moving in a straight line is given by $s(t) = t^3 + 2t + 9$. Find the instantaneous velocity at each time.

(i) t=1

(ii) t=4