MATH1013.com

We Make Math Easy.

Chapter 3.3

Tutorial Length
1 Hour

Homework ~ Tutorials ~ Past Tests

Important

Math 1013 is a HUGE course. Many students fear the course, but you don't need to, you've got us! The keys to success are to practice as many types of problems as possible and not to fall behind. Each chapter builds on the concepts of a previous chapter so it's crucial to understand the material from one chapter before moving on.

This is where MATH1013.COM comes in. We have developed extensive tutorial videos for each section that will give you a quick overview of the theory before we jump in to examples. Our goal is to make things as simple as possible. We will go through MANY examples in order to ensure you understand the concept. We want to show that one concept can be tested in multiple different ways. By making your way through all the questions, you will see different variations and learn new techniques that will make MATH 1013 a breeze. We'll show you shortcuts, easy tricks to remember, and even go through past test questions.

In short, if you're reading this, you're already on the right path. Your success is our success and we wish you the best with this course.

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Helpful Tips

- Each question has a 4 digit video ID code. If you only want to watch a specific example, just search for the 4 digit code in the playlists.
- Some sections are very long. Consider breaking it down into smaller periods of time (1 hour chunks) in order to efficiently absorb the information.
- When going through tutorial videos, if you are having a particularly difficult time with a question, skip it and come back later. Sometimes the brain just needs a bit of a break!
- Keep all of your MATH1013.com booklets in a binder. This way when it's time to do a final review for a test, you can quickly go through the material. Try to circle or highlight key points. These items will stand out when you begin reviewing.
- If you've purchased access to past tests, don't go through those questions until you feel you've learned all the material. Then go through as many past tests as possible in preparation for your actual test. Once you go through the solutions, you will see where you still have issues and what you still need to review.

Policy Reminder:

While sharing is caring, any user accounts found to be shared between students will be terminated with no refunds. Additionally, access to all premium content will expire after the final exam. Please see the account terms and conditions for more details.

Contact

Questions, Concerns, Comments? info@math1013.com
Please note we are unable to offer tutoring assistance over e-mail.

Note

Even though the textbook is just now introducing the trig integrals, through the website tutorials, we've already learned them in the previous sections (3.1 & 3.2). The tutorial questions have been copied again here for your convenience. The new topics from this section are presented after these trig derivative tutorials in case you prefer to skip the trig derivative videos.

Derivatives - Trig Functions

Derivative Of Trig Functions [VID_3648]

$if\ \ f(x) = \sin x \ \rightarrow\ \ f'(x) = \cos x$
$if\ \ f(x) = \cos x \ \rightarrow\ \ f'(x) = -\sin x$
$if\ \ f(x) = \tan x \ \rightarrow\ \ f'(x) = \sec^2 x$

$$\frac{d}{dx}(\sin x) = \cos x$$

$$\frac{d}{dx}(\cos x) = -\sin x$$

$$\frac{d}{dx}(\tan x) = \sec^2 x$$

Example [VID_8564]

Find $\frac{dy}{dx}$ if $y = 3\sin x - 2\cos x + tan\, x$

Derivative Notations

y' $\quad f'(x)$ $\quad \frac{dy}{dx}$ $\quad \frac{d}{dx}f(x)$

List Of Rules

Function	Derivative
c	0
x	1
x^n	nx^{n-1}
$c \cdot f(x)$	$c \cdot f'(x)$
$u(x) \pm v(x)$	$u'(x) \pm v'(x)$
e^x	e^x
a^x	$a^x \ln(a)$
$sin\, x$	$cos\, x$
$cos\, x$	$-sin\, x$
$tan\, x$	$sec^2\, x$

Example [VID_1980]

Differentiate the function $f(x) = \sin(x) - 4e^x + 3x^2 - 1$

Example [VID_0600]

Calculate $s'\ if\ s = 3t^2 + 2e^t - 2\cos t - \pi\, tan\, t$

Derivatives - Trig Functions

Derivative Of Trig Functions [VID_1912]

$if\ \ f(x) = \csc x \rightarrow\ f'(x) = -\csc x \cot x$
$if\ \ f(x) = \sec x \rightarrow\ f'(x) = \sec x \tan x$
$if\ \ f(x) = \cot x \rightarrow\ f'(x) = -\csc^2 x$

$\frac{d}{dx}(\csc x) = -\csc x \cot x$

$\frac{\mathrm{d}}{dx}(\sec x) = \sec x \tan x$

$\frac{\mathrm{d}}{dx}(\cot x) = -\csc^2 x$

Example [VID_3395]

Find $\frac{dy}{dx}$ if $y = 5\tan x\ - 2\sec x + x^{-3}$

Example [VID_4949]

Differentiate the function $f(x) = \sec x\ - 4\csc x$

Example [VID_5081]

Find the derivative of $y = \cot x - 3x^2 + 2^x$

Derivative Notations

y' $\quad f'(x)$ $\quad \frac{dy}{dx}$ $\quad \frac{d}{dx}f(x)$

List Of Rules

Function	Derivative
c	0
x	1
x^n	nx^{n-1}
$c \cdot f(x)$	$c \cdot f'(x)$
$u(x) \pm v(x)$	$u'(x) \pm v'(x)$
e^x	e^x
a^x	$a^x \ln(a)$
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\csc x$	$-\csc x \cot x$
$\sec x$	$\sec x \tan x$
$\cot x$	$-\csc^2 x$

Derivatives - Product rule

Example [VID_6805]

Find $\frac{dy}{dx}$ if $y = x^2 e^x$

Example [VID_2424]

Find y' if $y = 3x - 2 + e^x \sin x$

Example [VID_2218]

Find $\frac{dy}{dx}$ if $y = (5^x + 3\cot x)\tan x$

Derivative Notations

y' $\quad f'(x)$ $\quad \frac{dy}{dx}$ $\quad \frac{d}{dx}f(x)$

List Of Rules

Function	Derivative
c	0
x	1
x^n	nx^{n-1}
$c \cdot f(x)$	$c \cdot f'(x)$
$u(x) \pm v(x)$	$u'(x) \pm v'(x)$
$u \cdot v$	$u'v + v'u$
e^x	e^x
a^x	$a^x \ln(a)$
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\csc x$	$-\csc x \cot x$
$\sec x$	$\sec x \tan x$
$\cot x$	$-\csc^2 x$

Derivatives - Quotient rule

Example [VID_1262]

Find $\frac{dy}{dx}$ if $y = \frac{\tan x}{\sec x}$

Example [VID_0920]

Find y' if $y = \frac{e^x}{x^2+3x}$

Example [VID_6975]

Find $\frac{dy}{dx}$ if $y = \frac{3\cos x}{2^x+x^2} - e^x + 5$

Derivative Notations

y' $\quad f'(x)$ $\quad \frac{dy}{dx}$ $\quad \frac{d}{dx}f(x)$

List Of Rules

Function	Derivative
c	0
x	1
x^n	nx^{n-1}
$c \cdot f(x)$	$c \cdot f'(x)$
$u(x) \pm v(x)$	$u'(x) \pm v'(x)$
$u \cdot v$	$u'v + v'u$
$\frac{u}{v}$	$\frac{u'v - v'u}{v^2}$
e^x	e^x
a^x	$a^x \ln(a)$
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\csc x$	$-\csc x \cot x$
$\sec x$	$\sec x \tan x$
$\cot x$	$-\csc^2 x$

Special Trig Limits [VID_4910]

$$\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$$

If the limit involves trig functions and you are getting $\frac{0}{0}$, it's a strong indication to use the special trig limits.

Steps

Even though it's a bit involved, the following steps will help you get the answer correct every time.
Step 1) We must only have cos and sin terms, everything else needs to be converted.
Step 2) For every sin term remaining, multiply and divide by an appropriate term
Step 3) Collect the terms that fit the identity as they will all go to 1, and simplify the remaining terms.
Step 4) Evaluate the limit

General Trig Identities

$sin^2\theta + cos^2\theta = 1$ $sec^2\theta - tan^2\theta = 1$ $csc^2\theta - cot^2\theta = 1$

$tan\theta = \frac{sin\theta}{cos\theta}$ $cot\theta = \frac{1}{tan\theta}$ $sec\theta = \frac{1}{cos\theta}$ $csc\theta = \frac{1}{sin\theta}$

Example [VID_4307] Evaluate the following limit

$$\lim_{x \to 0} \frac{sin(4x)}{x}$$

Example [VID_5958] Evaluate the following limit

$$\lim_{x \to 0} \frac{x}{sin(4x)}$$

Example [VID_8839] Evaluate the following limit

$$\lim_{\theta \to 0} \frac{tan(2\theta)}{\theta}$$

Example [VID_2831] Evaluate the following limit

$$\lim_{x\to 0}\frac{3\sin(4x)}{\tan(2x)}$$

Example [VID_5967] Evaluate the following limit

$$\lim_{x\to 0}\frac{3x^2 cos(2x)\tan(5x)}{sin(x^2)}$$

Example [VID_7143] Evaluate the following limit

$$\lim_{\theta\to 0}\frac{2\sin(2\theta)\tan(3\theta)}{3\theta^2}$$

Example [VID_0960] Evaluate the following limit

$$\lim_{x\to 0}\frac{1-\cos^2(3x)}{4x^2}$$

Example [VID_8799] Prove the following equation.

$$\lim_{x\to 0}\frac{1-\cos(x)}{x}=0$$