www.StemMathMadeEasy.com

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STEM stands for Science, Technology, Engineering, and Math

If you are a STEM student, then this message is for you.

As you know Calculus and Differential Equations problems are what all STEM students must be able to solve. And, often they are very difficult to solve with the classical manual techniques still being taught in most math courses.

NO MORE thanks to a wonderful 21st Century Tool (2009) free to all!

You just need to ask Wolfram Alpha the questions properly and it will solve virtually any STEM math problem for you very quickly.

At www.StemMathMadeEasy.com/stem-math-challenge there are a dozen problems any STEM student will be able to solve very quickly and easily IF s/he knows how to use Wolfram Alpha properly.

We invite you to try them and see if you can solve them all easily in less than an hour using what you have been taught.

If you can't, then go to the link provided and you will be given the answers Wolfram Alpha will give you in a video and a PDF, and information on how you can get help mastering Wolfram Alpha should you so desire.

Now, here's a quick demonstration of a typical STEM math problem that could arise in engineering to show you how valuable Wolfram Alpha will be to you.

Suppose you are designing an arch which is the graph of Sin(x) from Pi/4 to 3Pi/4. You want to know the arc length of this arch.

In less than a minute, if you ask it right, Wolfram Alpha will give you the answer:

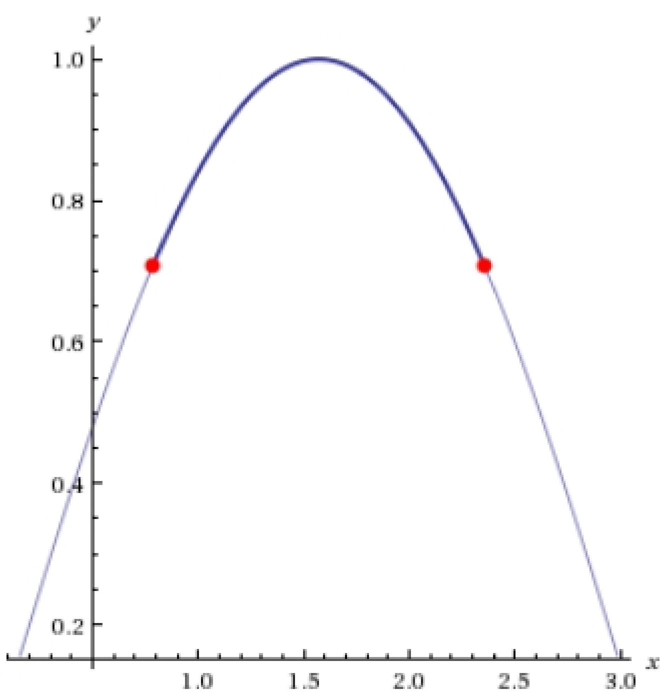
1.704

Why don't you try it and see how you would solve it.

Let me show you how it might be done in a typical Calculus 2 course.

It would, of course, be Calculus 2 since it involves a definite integral.

Perhaps you would like to pause the video and try it on your own using whatever you have learned so far about calculus. This is the Graph of the Sin(x) from Pi/4 to 3Pi/4 you want the length of.



You learned in Calculus that there is a definite integral which will be the arc length of a function, f(x), from x = a to b. You may remember, it is:

$$\int_a^b \sqrt{1 + f'(x)^2}\, dx$$

You know the derivative of Sin(x) is Cos(x), so all you need to do is evaluate:

$$\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \sqrt{1 + \cos^2(x)}\, dx$$

Now, the rubber meets the road!

See if you can evaluate this integral using what you have been taught.

Remember the answer is: 1.704.

You were taught in Calculus that you need to find an anti-derivative and apply the Fundamental Theorem of Calculus, FTC.

The FTC is the wonderful tool our ancestors discovered in the late 1600's, and is arguably the most important math discovery of all time. It was the tool that spawned modern science and technology, and thus, modern civilization.

There is only one problem! It is often difficult to find anti-derivatives.

You were taught "Techniques of Integration" in Calculus 2.

This simply means finding anti-derivatives and using the Fundamental Theorem of Calculus. Remember?

Many students find learning and mastering these "Techniques of Integration" very difficult, and often give up pursuing a STEM career.

They are difficult to master, and very time consuming and error prone to apply.

And, often they don't work!

When you can't find an anti-derivative, then you have to resort to finding a polynomial approximation of the function and finding its anti-derivative. This technique often results in what is then called a "Special Function". Often this is not taught in Calculus 2 and is deferred to more a advanced math course. This was a really big deal in the 19th and 20th Century.

OK. Back to our problem. Really looks simple doesn't it?

Just find the anti-derivative of:

$$\sqrt{1+\cos^2(x)}$$

Did you find it?

Answer: NO? I'm pretty sure you didn't.

There is no anti-derivative of this function discoverable by any Technique of Integration you have been taught in a typical Calculus 2 course!

If you look in a Table of Indefinite Integrals (i.e. anti-derivatives) you will discover that there is an anti-derivative of this function called an Elliptic Integral, which is what is called a Special Function.

$E(x \mid m)$ is the elliptic integral of the second kind with parameter $m = k^2$

Now, if you can evaluate this Special Function you will be able to apply the FTC.

$$\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \sqrt{1+\cos^2(x)}\, dx = \sqrt{2}\left(E\left(\frac{3\pi}{4} \,\middle|\, \frac{1}{2}\right) - E\left(\frac{\pi}{4} \,\middle|\, \frac{1}{2}\right)\right) \approx 1.70401$$

So, what would you do next using classical techniques?

If you didn't know about Special Functions, then you could find a polynomial approximation of the function and integrate it.

Could you find a Taylor series for this function and then integrate it to find the answer? That is what our ancestors would have done.

Let me point out, all of these pictures used in this presentation were out of Wolfram Alpha.

But, I didn't have to use them to get the answer. This is only to show you what you would have had to do using classical tools manually.

Using Taylor Series and derivatives you could find that the anti-derivative could be approximated by:

Series expansion of the integral at x=0:

$$\sqrt{2}\, x - \frac{x^3}{6\sqrt{2}} + \frac{x^5}{48\sqrt{2}} + O(x^6)$$

(Taylor series)

Now you can use this polynomial approximation to find an approximate value of the definite integral using the FTC:

$$2^{\frac{1}{2}}\left(3\times\frac{\pi}{4}\right) - \frac{\left(3\times\frac{\pi}{4}\right)^3}{6\times 2^{\frac{1}{2}}} + \frac{\left(3\times\frac{\pi}{4}\right)^5}{48\times 2^{\frac{1}{2}}} - 2^{\frac{1}{2}}\times\frac{\pi}{4} + \frac{\left(\frac{\pi}{4}\right)^3}{6\times 2^{\frac{1}{2}}} - \frac{\left(\frac{\pi}{4}\right)^5}{48\times 2^{\frac{1}{2}}}$$

Exact result:

$$\frac{\pi}{\sqrt{2}} - \frac{13\,\pi^3}{192\sqrt{2}} + \frac{121\,\pi^5}{24576\sqrt{2}}$$

Decimal approximation:

1.8023430968827346920904028973105827402718761836410847447 14...

So, what 's the bottom line lesson?

Learn to use Wolfram Alpha to solve all of the problems that arise in your science and engineering courses.

If you want to learn more go to: www.StemMathMadeEasy.com/demo

Give us your email address, and we will email you back a link to go to a Demo video which will show you several examples of STEM problems that can be solved very easily, so you can appreciate the power of Wolfram Alpha.

We will also send you more information and demos from time to time.

And, you will be given a special offer to enroll in an online program we have developed which could save you many-many frustrating hours of trying to learn all of this on your own.

Wolfram Alpha is very easy to use once you know all the right commands and techniques to use it.

You can no doubt discover these on your own without any help. I did.

But, I will confess, it took me many many hours to discover just how to use Wolfram Alpha when I was developing the Pre-Calculus, Calculus and Differential Equations programs to teach STEM math to high school students, Tiers 4, 5 and 6, at: www.homeschoolmathematics.com.

Fortunately, IF you already know calculus and differential equations, then our STEM Math Boot Camp program will teach you how to use Wolfram Alpha to solve any Calculus or Differential Equation problem in a few hours of your time.

We'll tell you all about it too when you go to our Demo, which is free of course.

www.StemMathMadeEasy.com/demo

The Demo is an 18 minute video demonstrating how, beyond any doubt . . .

STEM Math is now very easy!