

# Mathematics 1120H – Calculus II: Integrals and Series

TRENT UNIVERSITY, Summer 2018

## Assignment #1

### The Area of an Ellipse

Due on Monday, 25 June.

The area of the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  is  $\pi ab$ . Your task will be to verify that this is so.

1. Verify the area formula above using calculus. [6]

NOTE. You may need to look up an appropriate integration technique.

2. Verify the area formula above without using calculus. [4]

*Hint.* Compare cross-sections of the ellipse to those of a suitable circle.

### An Ode to a Derivative

Oh, Derivative, your form may be  
Anything . . . say quadratic.  
And any time I must deal with you  
My pulse becomes erratic.

For once I've found you, Derivative,  
You enable me to see  
That rate at which equations change,  
Whatever that may be.

Derivative, you are the limit  
As "h" approaches zero.  
And when I need a tangent's slope,  
You always are my hero.

(Unless you're feminine:  
then you're my heroine!)

But when I want *your* rate of change,  
That's a thing you never give.  
So I must find your other form:  
The Second Derivative!

And if it's o'er your non-differential form  
Which I wish to mull  
Then, again, must I change your beauteous shape  
And find your integral.

And lo! in this form there is hope,  
If you will observe,  
For in this form you show me  
The area under the curve.

Implicit or explicit,  
Your beauty is still stunning.  
Though it may make some people  
Turn their tails and start running.

But they can't outrun you, Derivative,  
No matter how they try;  
Your tangents reach from the deepest seas  
And up into the sky.

And you've many diff'rent notations,  
Some simple, some complex.  
I've known you to be just  $y'$ ,  
Or  $f'(x)$ .

But whatever your form, Derivative,  
No matter which you choose,  
The form which Leibniz gave to us,  
I shall always use.

For we owe so much to old Leibniz;  
He fulfilled his mathematic duty  
By making you, Derivative,  
A simple thing of beauty.

*Jim Newman*