

A2 Mathematics: Quickfire Revision 3

Dr Oliver

Dr Oliver Mathematics

February 27, 2018

Dr Oliver Mathematics

$$\frac{d}{dx}(e^{6x}) =$$

Dr Oliver Mathematics

Dr Oliver Mathematics

$$\frac{d}{dx}(e^{6x}) = 6e^{6x}$$

Dr Oliver Mathematics

Dr Oliver Mathematics

$$\frac{d}{dx}(e^{6x}) = 6e^{6x}$$

$$\frac{d}{dx}(\ln 4x)$$

Dr Oliver Mathematics

Dr Oliver Mathematics

$$\frac{d}{dx}(e^{6x}) = 6e^{6x}$$

$$\frac{d}{dx}(\ln 4x) = \frac{1}{x}$$

$$\frac{d}{dx}(e^{6x}) = 6e^{6x}$$

$$\frac{d}{dx}(\ln 4x) = \frac{1}{x}$$

$$\frac{d}{dx}(\sqrt{x})$$

$$\frac{d}{dx}(e^{6x}) = 6e^{6x}$$

$$\frac{d}{dx}(\ln 4x) = \frac{1}{x}$$

$$\frac{d}{dx}(\sqrt{x}) = \frac{1}{2}x^{-\frac{1}{2}}$$

$$\frac{d}{dx}(e^{6x}) = 6e^{6x}$$

$$\frac{d}{dx}(\ln 4x) = \frac{1}{x}$$

$$\frac{d}{dx}(\sqrt{x}) = \frac{1}{2}x^{-\frac{1}{2}}$$

$$\frac{d}{dx}[(3x + 7)^{50}]$$

$$\frac{d}{dx}(e^{6x}) = 6e^{6x}$$

$$\frac{d}{dx}(\ln 4x) = \frac{1}{x}$$

$$\frac{d}{dx}(\sqrt{x}) = \frac{1}{2}x^{-\frac{1}{2}}$$

$$\frac{d}{dx}[(3x + 7)^{50}] = 150(3x + 7)^{49}$$

$$\frac{d}{dx}(e^{6x}) = 6e^{6x}$$

$$\frac{d}{dx}(\ln 4x) = \frac{1}{x}$$

$$\frac{d}{dx}(\sqrt{x}) = \frac{1}{2}x^{-\frac{1}{2}}$$

$$\frac{d}{dx}[(3x + 7)^{50}] = 150(3x + 7)^{49}$$

$$\frac{d}{dx}[\sec(ax + b)]$$

$$\frac{d}{dx}(e^{6x}) = 6e^{6x}$$

$$\frac{d}{dx}(\ln 4x) = \frac{1}{x}$$

$$\frac{d}{dx}(\sqrt{x}) = \frac{1}{2}x^{-\frac{1}{2}}$$

$$\frac{d}{dx}[(3x + 7)^{50}] = 150(3x + 7)^{49}$$

$$\frac{d}{dx}[\sec(ax + b)] = a \sec(ax + b) \tan(ax + b)$$

$$\frac{d}{dx}(e^{6x}) = 6e^{6x}$$

$$\frac{d}{dx}(\ln 4x) = \frac{1}{x}$$

$$\frac{d}{dx}(\sqrt{x}) = \frac{1}{2}x^{-\frac{1}{2}}$$

$$\frac{d}{dx}[(3x + 7)^{50}] = 150(3x + 7)^{49}$$

$$\frac{d}{dx}[\sec(ax + b)] = a \sec(ax + b) \tan(ax + b)$$

$$\frac{d}{dx}(10^x)$$

$$\frac{d}{dx}(e^{6x}) = 6e^{6x}$$

$$\frac{d}{dx}(\ln 4x) = \frac{1}{x}$$

$$\frac{d}{dx}(\sqrt{x}) = \frac{1}{2}x^{-\frac{1}{2}}$$

$$\frac{d}{dx}[(3x + 7)^{50}] = 150(3x + 7)^{49}$$

$$\frac{d}{dx}[\sec(ax + b)] = a \sec(ax + b) \tan(ax + b)$$

$$\frac{d}{dx}(10^x) = (\ln 10)10^x$$

Dr Oliver Mathematics

$$11^2 =$$

Dr Oliver Mathematics

Dr Oliver Mathematics

Dr Oliver Mathematics

$$11^2 = 121$$

Dr Oliver Mathematics

Dr Oliver Mathematics

Dr Oliver Mathematics

$$11^2 = 121 \quad 9^3 =$$

Dr Oliver Mathematics

Dr Oliver Mathematics

Dr Oliver Mathematics

$$11^2 = 121$$

$$9^3 = 729$$

Dr Oliver Mathematics

Dr Oliver Mathematics

Dr Oliver Mathematics

$$11^2 = 121$$

$$9^3 = 729$$

$$(-15)^2 =$$

Dr Oliver Mathematics

Dr Oliver Mathematics

Dr Oliver Mathematics

$$11^2 = 121$$

$$9^3 = 729$$

$$(-15)^2 = 225$$

Dr Oliver Mathematics

Dr Oliver Mathematics

Dr Oliver Mathematics

$$11^2 = 121$$

$$9^3 = 729$$

$$(-15)^2 = 225$$

$$7^3 =$$

Dr Oliver Mathematics

Dr Oliver Mathematics

Dr Oliver Mathematics

$$11^2 = 121$$

$$9^3 = 729$$

$$(-15)^2 = 225$$

$$7^3 = 343$$

Dr Oliver Mathematics

Dr Oliver Mathematics

Dr Oliver Mathematics

$$11^2 = 121$$

$$9^3 = 729$$

$$(-15)^2 = 225$$

$$7^3 = 343$$

Dr Oliver Mathematics

$$17^2 =$$

Dr Oliver Mathematics

Dr Oliver Mathematics

$$11^2 = 121$$

$$9^3 = 729$$

$$(-15)^2 = 225$$

$$7^3 = 343$$

Dr Oliver Mathematics

$$17^2 = 289$$

Dr Oliver Mathematics

Squares and Cubes

Dr Oliver Mathematics

$$11^2 = 121$$

$$9^3 = 729$$

$$(-15)^2 = 225$$

$$7^3 = 343$$

Dr Oliver Mathematics

$$17^2 = 289$$

$$6^3 =$$

Dr Oliver Mathematics

Squares and Cubes

Dr Oliver Mathematics

$$11^2 = 121$$

$$9^3 = 729$$

$$(-15)^2 = 225$$

$$7^3 = 343$$

Dr Oliver Mathematics

$$17^2 = 289$$

$$6^3 = 216$$

Dr Oliver Mathematics

The Laws of Logarithms

Dr Oliver Mathematics

$$\log_a(xy) =$$

Dr Oliver Mathematics

Dr Oliver Mathematics

The Laws of Logarithms

Dr Oliver Mathematics

$$\log_a(xy) = \log_a x + \log_a y$$

Dr Oliver Mathematics

Dr Oliver Mathematics

The Laws of Logarithms

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right)$$

Dr Oliver Mathematics

Dr Oliver Mathematics

The Laws of Logarithms

Dr Oliver Mathematics

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

Dr Oliver Mathematics

Dr Oliver Mathematics

The Laws of Logarithms

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a(x^n)$$

The Laws of Logarithms

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a(x^n) = n \log_a x$$

The Laws of Logarithms

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a(x^n) = n \log_a x$$

$$\frac{\log_a x}{\log_a y}$$

The Laws of Logarithms

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a(x^n) = n \log_a x$$

$$\frac{\log_a x}{\log_a y} = \log_y x$$

The Laws of Logarithms

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a(x^n) = n \log_a x$$

$$\frac{\log_a x}{\log_a y} = \log_y x$$

$$\log_a a$$

The Laws of Logarithms

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a(x^n) = n \log_a x$$

$$\frac{\log_a x}{\log_a y} = \log_y x$$

$$\log_a a = 1$$

The Laws of Logarithms

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a(x^n) = n \log_a x$$

$$\frac{\log_a x}{\log_a y} = \log_y x$$

$$\log_a a = 1$$

$$\log_a 1$$

The Laws of Logarithms

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a(x^n) = n \log_a x$$

$$\frac{\log_a x}{\log_a y} = \log_y x$$

$$\log_a a = 1$$

$$\log_a 1 = 0$$

1. When can we model something as a lamina?

Dr Oliver Mathematics

Dr Oliver Mathematics

1. When can we model something as a lamina?
When one of its dimensions (thickness) is very small in comparison with its other two dimensions (length and breadth).

Dr Oliver Mathematics

Dr Oliver Mathematics

1. When can we model something as a lamina?
When one of its dimensions (thickness) is very small in comparison with its other two dimensions (length and breadth).
2. What is a peg?

1. When can we model something as a lamina?

When one of its dimensions (thickness) is very small in comparison with its other two dimensions (length and breadth).

2. What is a peg?

A support from which an object can be suspended or on which an object can rest.

Dr Oliver Mathematics

1. When can we model something as a lamina?
When one of its dimensions (thickness) is very small in comparison with its other two dimensions (length and breadth).
2. What is a peg?
A support from which an object can be suspended or on which an object can rest.
3. What is the consequence of modelling an object as a particle?

Modelling Assumptions

1. When can we model something as a lamina?

When one of its dimensions (thickness) is very small in comparison with its other two dimensions (length and breadth).

2. What is a peg?

A support from which an object can be suspended or on which an object can rest.

3. What is the consequence of modelling an object as a particle?

Its mass can be considered to be concentrated at a single point.

Kinematic Equations

1. Which kinematic equation involves only s , t , u , and v ?

Dr Oliver Mathematics

Dr Oliver Mathematics

Dr Oliver Mathematics

Kinematic Equations

1. Which kinematic equation involves only s , t , u , and v ?

Dr Oliver Mathematics

$$s = \frac{1}{2}(u + v)t$$

Dr Oliver Mathematics

Dr Oliver Mathematics

Kinematic Equations

1. Which kinematic equation involves only s , t , u , and v ?

$$s = \frac{1}{2}(u + v)t$$

2. Which kinematic equation involves only a , s , u , and v ?

Kinematic Equations

1. Which kinematic equation involves only s , t , u , and v ?

$$s = \frac{1}{2}(u + v)t$$

2. Which kinematic equation involves only a , s , u , and v ?

$$v^2 = u^2 + 2as$$

Kinematic Equations

1. Which kinematic equation involves only s , t , u , and v ?

$$s = \frac{1}{2}(u + v)t$$

2. Which kinematic equation involves only a , s , u , and v ?

$$v^2 = u^2 + 2as$$

3. Which kinematic equation involves only a , s , t , and u ?

Kinematic Equations

1. Which kinematic equation involves only s , t , u , and v ?

$$s = \frac{1}{2}(u + v)t$$

2. Which kinematic equation involves only a , s , u , and v ?

$$v^2 = u^2 + 2as$$

3. Which kinematic equation involves only a , s , t , and u ?

$$s = ut + \frac{1}{2}at^2$$

Angle between Two Lines

Let

$$\mathbf{r} = \mathbf{a} + \lambda\mathbf{b}$$

and

$$\mathbf{r} = \mathbf{c} + \mu\mathbf{d}$$

be the equations of two lines. How can I calculate the angle, θ , between the two lines?

Angle between Two Lines

Let

$$\mathbf{r} = \mathbf{a} + \lambda \mathbf{b}$$

and

$$\mathbf{r} = \mathbf{c} + \mu \mathbf{d}$$

be the equations of two lines. How can I calculate the angle, θ , between the two lines?

$$\cos \theta = \frac{\underline{\mathbf{b}} \cdot \underline{\mathbf{d}}}{|\underline{\mathbf{b}}| |\underline{\mathbf{d}}|}$$

How do I integrate ...?

$$\int \sin 3x \cos 2x dx$$

Dr Oliver Mathematics

Dr Oliver Mathematics

How do I integrate ...?

$$\int \sin 3x \cos 2x \, dx$$

Factor Formulae: $\sin P + \sin Q \equiv 2 \sin \left(\frac{P + Q}{2} \right) \cos \left(\frac{P - Q}{2} \right)$

How do I integrate ...?

$$\int \sin 3x \cos 2x \, dx$$

Factor Formulae: $\sin P + \sin Q \equiv 2 \sin \left(\frac{P + Q}{2} \right) \cos \left(\frac{P - Q}{2} \right)$

$$\sin 3x \cos 2x \equiv \frac{1}{2} (\sin 5x + \sin x)$$

How do I integrate ...?

$$\int \sin 3x \cos 2x \, dx = \frac{1}{2} \int (\sin 5x + \sin x) \, dx$$

Factor Formulae: $\sin P + \sin Q \equiv 2 \sin \left(\frac{P + Q}{2} \right) \cos \left(\frac{P - Q}{2} \right)$

$$\sin 3x \cos 2x \equiv \frac{1}{2} (\sin 5x + \sin x)$$

How do I integrate ...?

$$\begin{aligned}\int \sin 3x \cos 2x \, dx &= \frac{1}{2} \int (\sin 5x + \sin x) \, dx \\ &= \frac{1}{2} \left(-\frac{1}{5} \cos 5x - \cos x \right) + c\end{aligned}$$

Factor Formulae: $\sin P + \sin Q \equiv 2 \sin \left(\frac{P+Q}{2} \right) \cos \left(\frac{P-Q}{2} \right)$

$$\sin 3x \cos 2x \equiv \frac{1}{2} (\sin 5x + \sin x)$$

How do I integrate ...?

$$\begin{aligned}\int \sin 3x \cos 2x \, dx &= \frac{1}{2} \int (\sin 5x + \sin x) \, dx \\ &= \frac{1}{2} \left(-\frac{1}{5} \cos 5x - \cos x \right) + c \\ &= \underline{\underline{-\frac{1}{10} \cos 5x - \frac{1}{2} \cos x + c.}}\end{aligned}$$

Factor Formulae: $\sin P + \sin Q \equiv 2 \sin \left(\frac{P+Q}{2} \right) \cos \left(\frac{P-Q}{2} \right)$

$$\sin 3x \cos 2x \equiv \frac{1}{2} (\sin 5x + \sin x)$$

How can I show that the function

$$f(x) \equiv x^3 - 3x^2 - 2x + 5$$

has a solution α such that $3 < \alpha < 4$?

How can I show that the function

$$f(x) \equiv x^3 - 3x^2 - 2x + 5$$

has a solution α such that $3 < \alpha < 4$?

$f(3)$

How can I show that the function

$$f(x) \equiv x^3 - 3x^2 - 2x + 5$$

has a solution α such that $3 < \alpha < 4$?

$$f(3) = -1$$

How can I show that the function

$$f(x) \equiv x^3 - 3x^2 - 2x + 5$$

has a solution α such that $3 < \alpha < 4$?

$$f(3) = -1$$

$$f(4)$$

How can I show that the function

$$f(x) \equiv x^3 - 3x^2 - 2x + 5$$

has a solution α such that $3 < \alpha < 4$?

$$f(3) = -1$$

$$f(4) = 13$$

How can I show that the function

$$f(x) \equiv x^3 - 3x^2 - 2x + 5$$

has a solution α such that $3 < \alpha < 4$?

$$f(3) = -1$$

$$f(4) = 13$$

Since there is a change in sign of a **continuous** function, there is a solution α such that $3 < \alpha < 4$, as required.

It is suggested that 1.20 (2 dp) is a solution to the equation

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

How can we verify that this solution is, in fact, correct to 2 decimal places?

It is suggested that 1.20 (2 dp) is a solution to the equation

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

How can we verify that this solution is, in fact, correct to 2 decimal places?

$$f(1.195)$$

It is suggested that 1.20 (2 dp) is a solution to the equation

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

How can we verify that this solution is, in fact, correct to 2 decimal places?

$$f(1.195) = 0.032\,414\,875 \text{ (FCD)}$$

It is suggested that 1.20 (2 dp) is a solution to the equation

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

How can we verify that this solution is, in fact, correct to 2 decimal places?

$$f(1.195) = 0.032\,414\,875 \text{ (FCD)}$$

$$f(1.205)$$

It is suggested that 1.20 (2 dp) is a solution to the equation

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

How can we verify that this solution is, in fact, correct to 2 decimal places?

$$f(1.195) = 0.032\,414\,875 \text{ (FCD)}$$

$$f(1.205) = -0.016\,384\,875 \text{ (FCD)}$$

It is suggested that 1.20 (2 dp) is a solution to the equation

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

How can we verify that this solution is, in fact, correct to 2 decimal places?

$$f(1.195) = 0.032\,414\,875 \text{ (FCD)}$$

$$f(1.205) = -0.016\,384\,875 \text{ (FCD)}$$

Since there is a change in sign of a **continuous** function, there is a solution α such that $1.195 < \alpha < 1.205$. Hence

$$\alpha = 1.20 \text{ (2 dp)}.$$