Mathematical Models 2

Final Examination

Winter 2011

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For numeric answers, please use 4 decimal places

*2 mark questions*

What is the Root-Mean-Square of this current: i = 15 sin(4t) ?

Here are two currents: i1 = 3 + 4 sin x + 5 sin 2x + …

and i2 = 8 – 7 sin x – 6 sin 2x -…

What is the result of adding the currents ?

Is a solution of

Is a solution of ?

*3 mark questions*

What is the equation of the line tangent to at the point where x = 32 ?

Find the derivatives:

y = 4 sin 3x cos 2x

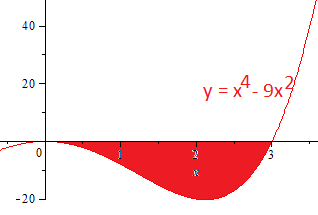
For what value of x does y = 2x3 – 15x2 + 24x + 11 reach its maximum between 0 and 6? For what value does it reach its minimum ?

*4 mark questions*

Use Newton’s Method to solve x3 + 5x – 11 = 0 accurate to 4 decimal places.

Integrate:

Find this area:



Use Simpson’s Rule with n= 6 to approximate this integral:

The charge on a capacitor is the integral of the current going through it. Start your capacitor off with a charge of 20 Coulombs and run a current of i = 5t (i in milliamps, t in seconds) through it. What is the charge after 4 seconds ?

Find the area between y = sin x, y = cos x, x = 0 and x = 0.5 .

Integrate:

Integrate

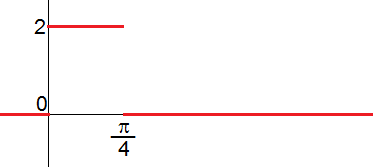
Find the solution of

Find the solution of

Find the solution of

*6 mark question*

Consider the function that is 2 for 

and 0 for the rest of -π to π. Here is its graph:

I am interested in its Fourier Expansion.

What is a0 =

What is a1 =

What is b1 =

Use these values to write the beginning of the Fourier Expansion of the function.

Backup

Find the equation of the line normal to at the point (6, 3).

y = 7 sin-1(2x – 15)

????

Find the derivative implicitly: x2 – y4 = x sin y

Bryan wants to fence an area of 1250 m2 for his employees parking. To keep it simple, the parking lot will be a rectangle, with fence on 3 sides. The fourth side is along the side wall of the Les Entreprises Bryan building. What dimensions (length and width) use the minimum amount of fence ?

What is the Differential of y = ex – 3x ?

Find the area between y = 2x , x = 1, x = 2 and the x-axis. A diagram might be useful.

Use the Trapezoidal Rule with n = 5 to approximate this area:

What is the area between the two curves: y = x3 and y = 9x2 – 24x ?

Find the solution of sin y y’ – 4x = 0

Answers

10.6066

11 – 3 sin x – sin 2x …

no

yes

y = 1/80 x + 1.6

y’ = 12 cos 3x cos 2x – 8 sin 3x sin 2x

y’ = 5 ln 5x + 5

Max at x = 6

Min at x = 4

1.5106

1.5x4 – 4/3 x3 + 9x2 + C

32.6667

32.4

1.6434

This should be 20.040 coulombs, because milliamps changes the units to millicoulombs.

0.3570

0.4054

4 sin 2x + C

+ C

ln|x2 + 16| + C

a0 = 0.25

a1 = 0.4505

b1 = 0.1865

f = 0.25 + 0.4505 cos x + … + 0.1865 sin x + …