BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 12A

1

A manufacturer of tennis balls has a daily cost $C(x) = 200 - 10x + 0.01x^2$ where C is the total cost in £ and x is the number of tennis balls produced.

(a) Write C in the form $-A + B(x - C)^2$ where A, B, C are constants to be found

(b) What number of tennis balls produces the minimum cost?

TAP FOR ANSWERS

2

A cubic polynomial is defined as

$$p(x) = x^3 - 4x^2 + x + 6$$

(a) Fully factorise the cubic

(b) Sketch the cubic

TAP FOR ANSWERS

3

$f(x) = \frac{5x^2+7x}{2x^4}$

(a) Split f(x) into two fractions and find an expression for f'(x)

(b) Now consider the functions $g(x) = 5x^2 + 7x \ \ and \ h(x) = 2x^4$. Find expressions for g'(x) and h'(x)

(c) Now, $f(x) = \frac{g(x)}{h(x)}$ Which one of the following rules is true?

A $f(x) = \frac{g\prime(x)}{h\prime(x)}$

B $f(x) = \frac{g'(x)h(x)+g(x)h\prime(x)}{h(x)}$

C $f(x) = \frac{g'(x)h(x)-g(x)h\prime(x)}{h(x)^2}$

D $f(x) = \frac{g'(x)h(x)+g(x)h\prime(x)}{h(x)^2}$

E $f(x) = \frac{g(x)h'(x)-g\prime(x)h(x)}{h(x)}$

TAP FOR ANSWERS

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The circle C has equation $x^2 + y^2 - 12x + 8y + 16 = 0$

(a) Find the centre and radius of C

(b) Given that C crosses the x axis at the points A and B, find the length AB giving your answer in the form $k\sqrt{5}$

TAP FOR ANSWERS

5

Algebraic Division & Algebraic Fractions

(*a*) Simplify $\frac{3x^2-x-2}{x^2-1}$

(*b*) Hence, or otherwise, express $\frac{3x^2-x-2}{x^2-1} - \frac{1}{x(x+1)}$ as a single fraction in its simplest form

TAP FOR ANSWERS

6

A large tank is in the shape of a cuboid with a rectangular base and no top. Two of the vertical opposite faces of the cuboid are square and the height of the cuboid is x metres.

(a) given that the surface area of the tank is 54 m^2, show that the capacity, V, of the tank is given by $V = 18x - \frac{2}{3}x^3$.

(b) Find the maximum value for V, fully justifying the fact that it is the maximum value.

TAP FOR ANSWERS

7

Solve these equations for $0 \leq \theta \leq 360^{o}$, giving θ to 1 decimal place where appropriate:

(a) $\sin(\theta + 15^{\circ}) = 3\cos(\theta + 15^{\circ})$

(b) $\sin\theta\cos\theta = \frac{1}{2}$

TAP FOR ANSWERS

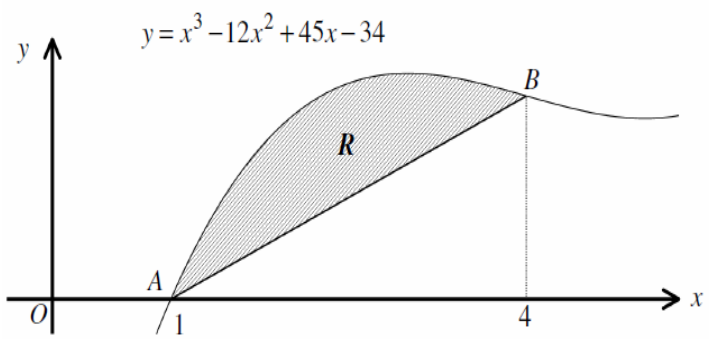
8

The circle C has equation $x^2 - 2kx + y^2 - ky + 15 = 0$. The line l passes through the point P (5, 9), has gradient 2, and is a tangent to the circle C.

Find the value of k, where k is a positive constant

TAP FOR ANSWERS

9



The figure above shows the curve with equation

$$y = x^3 - 12x^2 + 45x - 34$$

The points A and B lie on the curve, where $x = 1$ and $x = 4$ respectively. The finite region R is bounded by the curve and the straight line segment AB. Show that the area of R, shown shaded in the figure is $\frac{81}{4}$

TAP FOR ANSWERS

10

Prove that every integer that is a perfect cube is a multiple of 9 or is one more than a multiple of 9 or is one less than a multiple of 9.

TAP FOR ANSWERS

Use your knowledge of the approximations for $cosx$ and $sinx$, to find the value of

(a) $\frac{cos3x-1}{x^2}$

(b) $\frac{cos3x-1}{xsin4x}$

(c) $\frac{4xsin2x}{x^2}$

for small values of x.

TAP FOR ANSWERS

12

Prove the following identities:

(a) $\tan^2 x + \cot^2 x \equiv \sec^2 x + \operatorname{cosec}^2 x - 2$

(b) $(\sec^2 x + \tan^2 x)(\operatorname{cosec}^2 x + \cot^2 x) \equiv 1 + 2\sec^2 x \operatorname{cosec}^2 x$

TAP FOR ANSWERS

By using the chain rule find $\frac{dy}{dx}$

(a) $y = \left(4x^2 - 3\right)^5$

(b) $y = \frac{1}{\left(7 - 2x^3\right)}$

(c) $y = \sqrt{4x + 2x^2}$

(d) $y = \sin 3x$

(e) $y = sin^2 x$

(f) $y = \sin(x^2)$

(g) $y = \cos^2 3x$

TAP FOR ANSWERS

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1. By using the product rule find $\frac{dy}{dx}$ simplifying your answers

(a) $y = x^4\left(x^5 - 2\right)^6$ (b) $y = x^2 \sin x$ (c) $y = \sqrt{x}\cos 3x$

2. By using the quotient rule find the derivatives of the following:

(a) $\frac{x+3}{2x+1}$ (b) $\frac{3x^2}{(2x-1)^2}$ (c) $\frac{x^4}{\cos 3x}$

TAP FOR ANSWERS

BHASVIC MαTHS
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15

1. Complete this old spec paper

https://www.madasmaths.com/archive/iygb_practice_papers/c1_practice_papers/c1_n.pdf

2.

TAP FOR ANSWERS

1 - Answers

(a) $A = 2300, B = 0.01, C = 500$

(b) 500

TAP TO RETURN

2 - Answers

$(x-3)(x-2)(x+1)$

TAP TO RETURN

3 - Answers

(a) $-\frac{5}{x^3}-\frac{21}{2x^4}$

(b) 10x + 7, $8x^3$

(c) C

TAP TO RETURN

4 - Answers

(a) Centre (6, -4) radius 6

(b) $k = 4$

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 12A

5 - Answers

a) $\frac{3x+2}{x+1}$

b) $\frac{3x-1}{x}$

TAP TO RETURN

6 - Answers

(b) 36

TAP TO RETURN

7 - Answers

(a) 56.6^o, 236.6^o

(b) 45^o, 225^o

TAP TO RETURN

8 - Answers

k=4

TAP TO RETURN

9 - Answers

Proof

TAP TO RETURN

10 - Answers

Proof

TAP TO RETURN

11 - Answers

(a) $-\frac{9}{2}$

(b) $-\frac{9}{8}$

(c) 8

TAP TO RETURN

12 - Answers

Proof

TAP TO RETURN

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13 - Answers

(a) $40x\left(4x^2-3\right)^4$ (b) $\dfrac{6x^2}{\left(7-2x^3\right)^2}$ (c) $\dfrac{2+2x}{\sqrt{4x+2x^2}}$

(d) $3\cos 3x$ (e) 2 sinxcosx (f) $2x\cos(x^2)$ (g) $-6\cos 3x\sin 3x$

TAP TO RETURN

BHASVIC MαTHS
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14 - Answers

1. (a) $2x^3(x^5-2)^5(17x^5-4)$ (b) $x^2\cos x+2x\sin x$ (c) $-3\sqrt{x}\sin 3x+\frac{\cos 3x}{2\sqrt{x}}$

2. $(a)\ \frac{-5}{(2x+1)^2}$ (b) $\frac{-6x}{(2x-1)^3}$ (c) $\frac{x^3(3x\sin 3x+4\cos 3x)}{\cos^2 x}$

TAP TO RETURN

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A1 DOUBLES ASSIGNMENT 12A

15 - Answers

1.
https://www.madasmaths.com/archive/iygb_practice_papers/c1_practice_papers/c1_n_marks.pdf

2.

TAP TO RETURN