C.E.M.TUITION

Name : _____

2 Unit Final HSC Review

Year 12

TOPICS COVERED IN THE HSC OVER THE LAST FEW YEARS :

Assorted topics in Question 1 :

1993 Q1 (f)

Solve $5 - 3x < 7$

$x > -\frac{2}{3}$

1992 Q1 (f)

A sum of \$10 000 is placed in a bank account and earns 12% interest per annum, compounded annually.
How much money is in the account at the end of 6 years, just after the final interest has been paid?

\$19738.23

1991 Q1(f)

Mark on a number line the values of x for which $|x+1| \leq 3$

$-4 \leq x \leq 2$

Coordinate Geometry

1993 Q2 - Gradients - Distance formula - Mid-point formula - Properties of rhombus, square
1992 Q2 - Gradients - Equation of line - Perp. distance formula - Mid-point formula - Sketching regions
1991 Q2 - Plotting points - Gradients ($m_1 \times m_2 = -1$) - Perp. distance formula -Congruency - Distance formula - Area of quadrilateral
1990 Q2 - Plotting points - Equation of line - Properties of parallelogram - Area of parallelogram
1989 Q2 - Plotting points - Equation of line - Distance formula - Area of triangle

Gradients : $m_1 = m_2$ for parallel lines ; $m_1 \times m_2 = -1$ for perpendicular lines

Midpoint formula : $(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2})$

Equation of line : $y - y_1 = m(x - x_1)$

Perpendicular distance formula : $\frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$

Congruency tests : [1] Side, Side, Side

[2] Side, Angle, Side

[3] Angle, Angle, Side

[4] Right angle, Hypotenuse, Side

Trigonometry

1993 Q4(a) - Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

1992 Q3(c) - Sine Rule

1991 Q4(b) - Cosine Rule $a^2 = b^2 + c^2 - 2bc\cos A$
True bearings e.g. $030^0 T, 150^0 T$

1990 Q4(b) - Angle of elevation and depression - Sine rule

1989 Q4(b) - Cosine Rule - True bearings

Differentiation

1993 Q3(a) - $\frac{d}{dx}(\sin u) = \cos u \times \frac{du}{dx}$

$$\frac{d}{dx}(x^n) = nx^{n-1}$$

$$\frac{d}{dx}(\ln u) = \frac{1}{u} \times \frac{du}{dx}$$

$$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$$

1992 Q3(a) - $\frac{d}{dx}(e^u) = e^u \times \frac{du}{dx}$

$$\frac{d}{dx}(\tan u) = \sec^2 u \times \frac{du}{dx}$$

1991 Q3(a) - Differentiate

[i] $3x^2 + 5x$

$\boxed{6x + 5}$

[ii] $\tan 3x$

$\boxed{3\sec^2 3x}$

[iii] $\frac{\ln x}{x}$

$\boxed{\frac{1-\ln x}{x^2}}$

1990 Q3(b) - Differentiate

[i] $7x^5 + 3$

$35x^4$

[ii] $2\sin x + \sqrt{x}$

$2\cos x + \frac{1}{2\sqrt{x}}$

[iii] $x \ln x$

$1 + \ln x$

1989 Q3(a)

[ii] $x\cos x$

$-x\sin x + \cos x$

Integration

1993 Q3(c) - $\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{a(n+1)} + c$

$\int \sin(ax)dx = -\frac{1}{a}\cos ax + c$

[i] $\int (x-1)^3 dx$

$\boxed{\frac{(x-1)^4}{4} + c}$

[ii] $\int_0^{\frac{\pi}{2}} \sin 2x \, dx$

1992 Q3(b)

[i] $\int (2x+3)^{10}\,dx$

$\frac{(2x+3)^{11}}{22}+c$

[ii] $\int \sin\frac{x}{2}\,dx$

$-2\cos\frac{x}{2}+c$

1991 Q3 - $\int \frac{f'(x)}{f(x)}\,dx = \ln(f(x)) + c$

$\int e^{ax}\,dx = \frac{1}{a}e^{ax}+c$

[b] $\int \frac{dx}{3x+5}$

$\frac{1}{3}\ln(3x+5)+c$

[c] $\int_0^1 e^{4x}\,dx$

$\frac{1}{4}(e^4-1)$

1990 Q3(c)

[i] $\int (\cos x + 5x^2)\, dx$

$\sin x + \frac{5x^3}{3} + c$

[ii] $\int_0^1 (1 + e^{-x})\, dx$

$2 - \frac{1}{e}$

1989 Q3

[b] $\int (x^2 + \frac{2}{x})\, dx$

$\frac{1}{3}x^3 + 2\ln x + c$

[c] $\int_0^1 (e^{3x}+1)\,dx$

$\frac{1}{3}(e^3+2)$

PLANE GEOMETRY

1993 Q1(vii)- Properties of a parallelogram, rhombus and square.
Diagonals bisect each other.
Q4(c) - Exterior angle of triangle is equal to the sum of the interior remote angles.
Sides opposite isosceles triangles are equal.

1992 Q1(d) - Vertically opposite angles are equal.
Alternate angles are equal on a pair of parallel lines.
Q4(a) - Area of a trapezium is $\frac{h}{2}(a+b)$ where h is the height between the parallel lines and a, b are the lengths of the parallel sides.
Q5(b) - Congruent triangles properties.

1991 Q3(d) - Opposite angles of a rhombus are equal.
A straight angle is equal to 180^0.

1990 Q5(b) - The sum of the interior angles of an n-sided polygon is $(2n-4)\times 90^0$.
The sum of the exterior angles of an n-sided polygon is .
Q7(a) - Congruent triangles.

1989 Q4(a) - Properties of an equilateral triangle.
Q9(c) - Congruent triangles and Pythagoras' theorem.

ARITHMETIC & GEOMETRIC PROGRESSION :

1993 Q5(c) - A.P. $T_n = a + (n-1)d$
$S_n = \frac{n}{2}[2a + (n-1)d]$

A tap and n water troughs are in a straight line. The tap is first in line, 2 metres from the first trough, and there is 3 metres between consecutive troughs. A stable hand fills the troughs by carrying a bucket of water from the tap to each trough and then returning to the tap. Thus she walks 2 + 2 = 4 metres to fill the first trough, 10 metres to fill the second trough, and so on.

[i] How far does the stable hand walk to fill the k th trough ?

$T_k = 6k - 2$

[ii] How far does the stable hand walk to fill all n troughs ?

$S_n = n(3n + 1)$

[iii] The stable hand walks 1220 metres to fill all the troughs. How many water troughs are there ?

$n = 20$

1992 Q5 (c)

A timber worker is stacking logs. The logs are stacked in layers, where each layer contains one log less than layer below. There are five logs in the top layer, six logs in the next layer, and so on. There are n layers altogether.

[i] Write down the number of logs in the bottom layer.

$U_n = (n+4)$

[ii] Show that there are $\frac{1}{2}n(n+9)$ logs in the stack.

1992 Q10 (a)

(i) For what values of r does the geometric series $a+ar+ar^2+\ldots$ have a limiting sum ?

$\boxed{-1<r<1}$

(ii)For these values of r write down the limiting sum.

$\boxed{\frac{a}{1-r}}$

(iii) Find a geometric series with common ratio $\frac{1}{w}$ that has limiting sum $\frac{1}{1-w}$.

$\boxed{\frac{1}{w}-\frac{1}{w^2}-\frac{1}{w^3}-\ldots}$

1991 Q5 (b)

The tenth term of an arithmetic sequence is 29 and the fifiteenth term is 44.

(i) Find the value of the common difference and the value of the first term.

$a = 2,\ d = 3$

(ii) Find the sum of the first 75 terms.

8475

1990 Q4 (a)

The sum of the first n terms of a certain arithmetic series is given by $S_n = \frac{n(3n+1)}{2}$.

(i) Calculate S_1 and S_2

$S_1 = 2, S_2 = 7$

(ii) Find the first three terms of this series

2, 5, 8

(iii) Find an expression for the n th term.

$U_n = 3n - 1$