CASIO

FX-991ZAPLUS

TECHNICAL MATHS
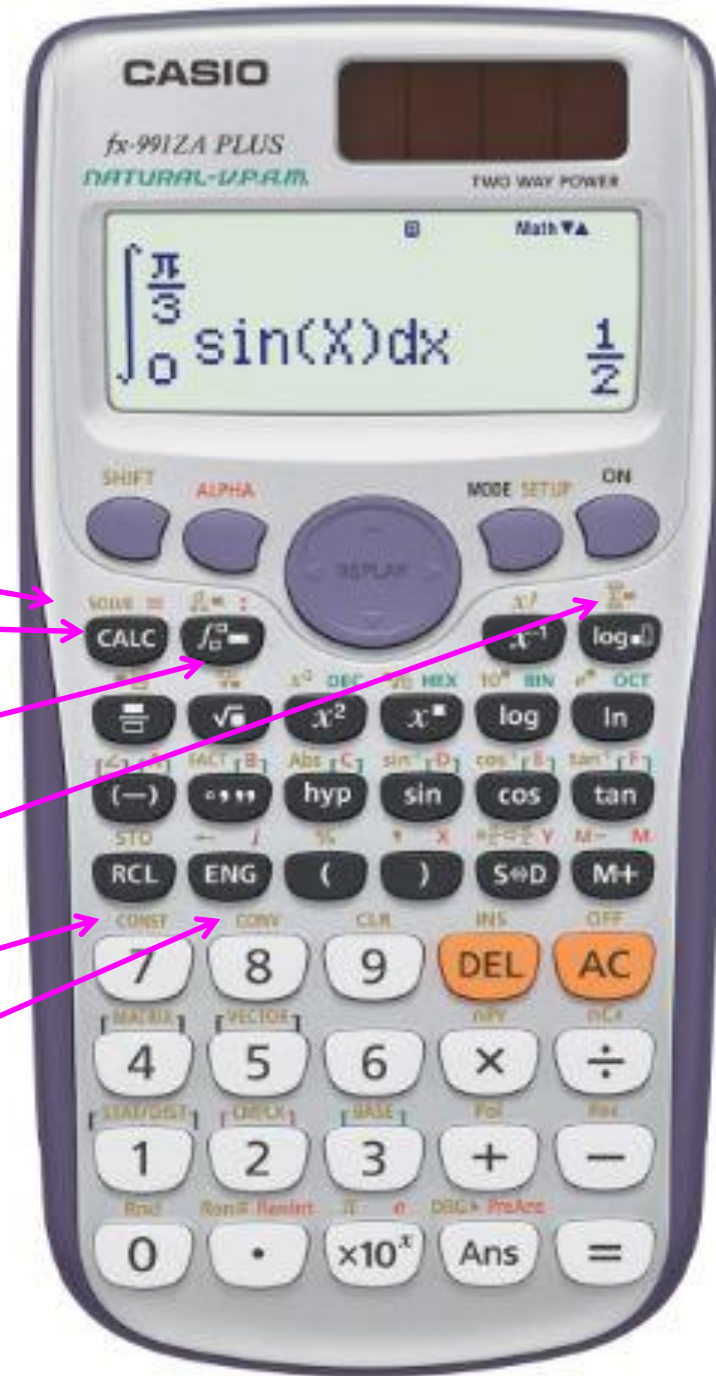
MODE SETUP
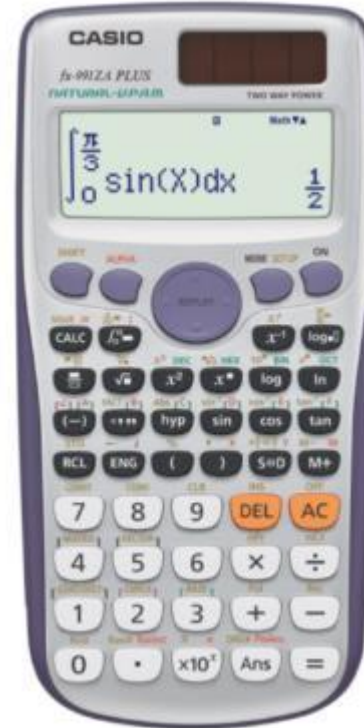
FX-82ZA PLUS vs. FX-991ZA PLUS

CASIO FX-82ZA PLUS		CASIO FX-991ZA PLUS	
1: COMP	2: STAT	1: COMP	2: CMPLX
3: TABLE		3: STAT	4: BASE-N
		5: EQN	6: MATRIX
		7: TABLE	8: VECTOR

FX-991ZAPLUS

SOLVE for an unknown

CALC the value of an expression

INTEGRATION & DIFFERENTIATION

SIGMA NOTATION calculations

SCIENTIFIC CONSTANTS

METRIC CONVERSIONS

$$\int_0^{\frac{\pi}{3}} \sin(X)\,dx \qquad \frac{1}{2}$$

CASIO means TECHNOLOGY

Don't Forget

Initialise/Reset your calculator

when you want to clear your calculator &

return the calculation mode and setup to the

initial default settings.

SHIFT   9   3   =   AC

Note:

This operation also clears all data

currently in the calculator memory

TIME CALCULATIONS

A. CONVERTING FROM A DECIMAL TO HOURS, MINUTES AND SECONDS

How long will it take to travel a distance of 534km, if your average speed is 90km/h?

$$\text{Time} = \frac{\text{distance}}{\text{speed}} = \frac{534}{90}$$

= .... = ...hours..........minutes and..........seconds

B. CONVERTING FROM HOURS, MINUTES AND SECONDS TO A DECIMAL

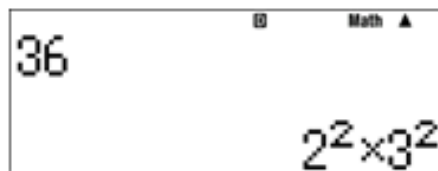At what speed are you travelling if 150km takes 1 hour 16 minutes and 17 seconds.

$$\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{150}{1°16°17°} = ...\text{km/h}$$

PRIME FACTORS

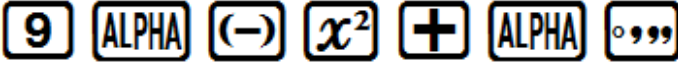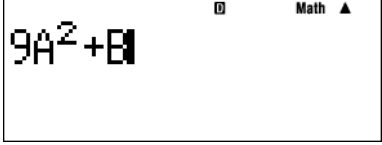| Find the prime factors of:	36 Math ▲
1. 36	
③ ⑥ = [SHIFT] [▫▸▸▸]	$2^2 \times 3^2$

2. $256 = $ ....

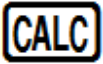3. $2\,835 = $ ....

MODE 1 : COMP (Computational Mode)

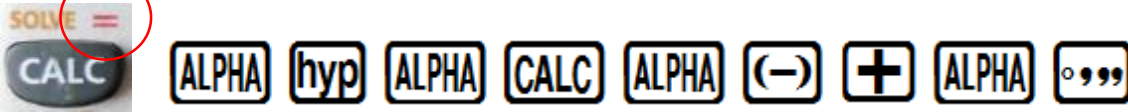Using <u>CALC</u> to find the value of an expression

Calculate for $a = 2$ and $b = 6$

1. $9a^2 + b$

   Input expression [9] [ALPHA] [(-)] [x²] [+] [ALPHA] [•,,,]

   $9A^2+B$ Math ▲

   [CALC] Substitute A? 0 [2] [=] Math

   B? 0 [6] [=] $9A^2+B$ 42 Math ▲

2. $c = a + b$

   Input expression [CALC] [ALPHA] [hyp] [ALPHA] [CALC] [ALPHA] [(-)] [+] [ALPHA] [•,,,]

   C=A+B Math ▲

   [CALC] A? 2 Math ▲ [=] B? 6 Math ▲ [=]

   C=A+B 8 Math ▲
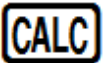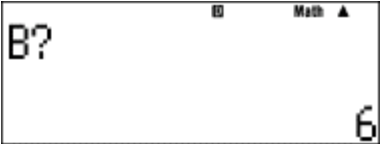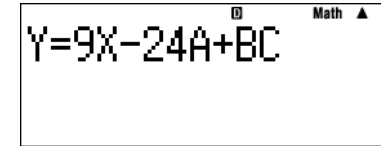
Using <u>SOLVE</u> to find the solution of equations

$y = 9x - 24a + bc$, with $a = 2$, $b = 3$ and $c = 6$

1) Solve for x, when $y = 0$

Y=9X−24A+BC
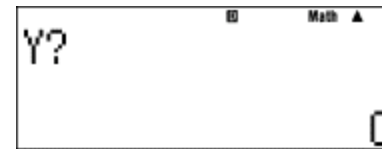
Input expression
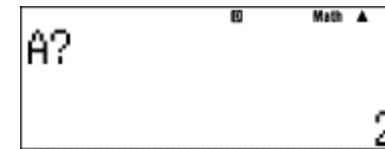
ALPHA S↔D ALPHA CALC 9 ALPHA) − 2 4 ALPHA (−) + ALPHA ••• ALPHA hyp

SOLVE
=
CALC SHIFT CALC Substitute

Y?
    0

=

A?
    2

=

B?
    6

3 =

C?
    8

6 =

Solve for X
    0

=

Y=9X−24A+BC
X=   3.333333333
L−R=   0
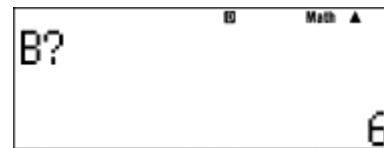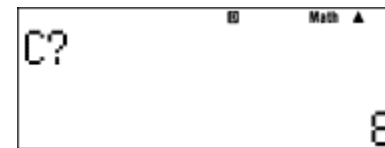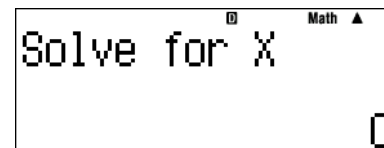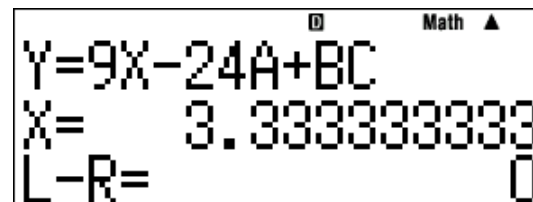
→ expression
→ solution
→ the closer this value to zero the more
           accurate the solution

2) Solve for b, when $y = 3$, $x = 2$, $a = 2$ and $c = 6$

Return to expression

◄ SHIFT) ALPHA ••••

Y=9X−24A+BC,B   Math ▲

SOLVE =

SHIFT CALC

CALC

Substitute

Y?   Math ▲
0

3 =

X?   Math ▲
3.333333333

2 =

A?   Math ▲
2

=

C?   Math ▲
6

=

Solve for B   Math ▲
3

=

Y=9X−24A+BC,B   Math ▲
B=   5.5
L−R=   0

CASIO means TECHNOLOGY
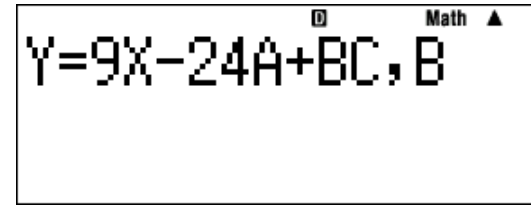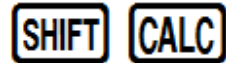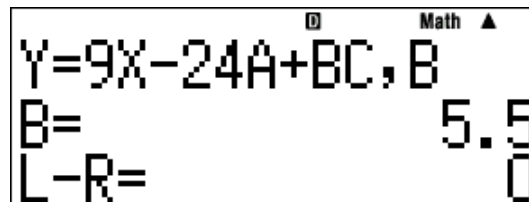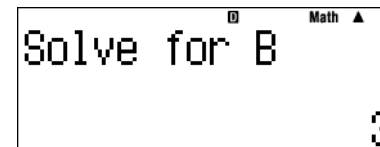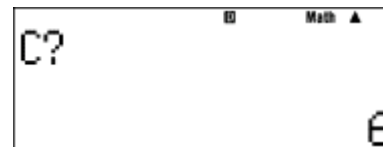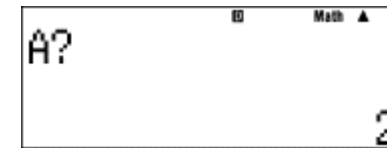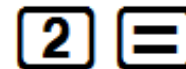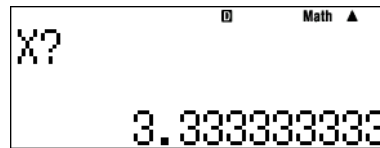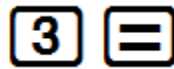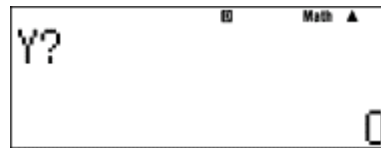
Solve: $2 \log x + 3 \log x = 10$
$x = 100$

SOLVE works in COMPUTATIONAL mode only

SOLVE can solve for variables other than "*x*"

SOLVE works for equations other than quadratic & cubic

SCIENTIFIC NOTATION

✓**CONVERTING FROM SCIENTIFIC NOTATION TO A WHOLE NUMBER OR DECIMAL**

Convert 3×10^4 to a rational number:
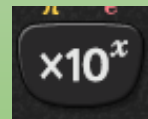
$\boxed{3}\ \boxed{\times 10^x}\ \boxed{4}\ \boxed{=}$
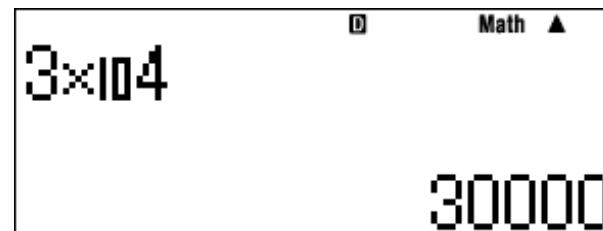
✓CONVERTING TO SCIENTIFIC NOTATION

Convert 148 501 000 to scientific notation with **three** significant digits:

| 1 | 4 | 8 | 5 | 0 | 1 | 0 | 0 | 0 | = |

To enter **SCIENTIFIC NOTATION**: [SHIFT] [MODE]

```
1:MthIO  2:LineIO
3:Deg    4:Rad
5:Gra    6:Fix
7:Sci    8:Norm
```
[7]

```
Sci 0∿9?
```
[3]

Select the number of **significant digits**

```
                    D    SCI Math ▲
148501000

            1.49×10⁸
```

✓ENGINEERING KEY

Transforms a displayed value to engineering notation

[SHIFT] [ENG]   [ENG]

shifts the decimal point to the left   ENG   shifts the decimal point to the right

MODE 5 : EQN (Equation)

MODE [screen: 1:COMP 2:CMPLX / 3:STAT 4:BASE-N / 5:EQN 6:MATRIX / 7:TABLE 8:VECTOR] 5
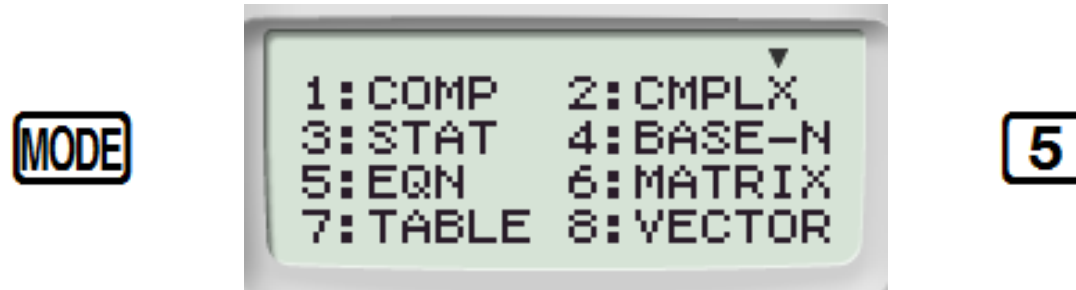
1. Simultaneous equations (2 unknowns)
2. Simultaneous equations (3 unknowns)
3. Quadratic equation
4. Cubic equation

[screen: 1:$a_nX+b_nY=c_n$ / 2:$a_nX+b_nY+c_nZ=d_n$ / 3:$aX^2+bX+c=0$ / 4:$aX^3+bX^2+cX+d=0$]
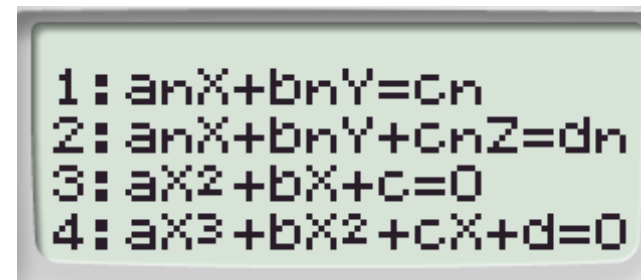
MODE 5 : EQN

Solving
SIMULTANEOUS EQUATIONS
with 2 unknowns

①
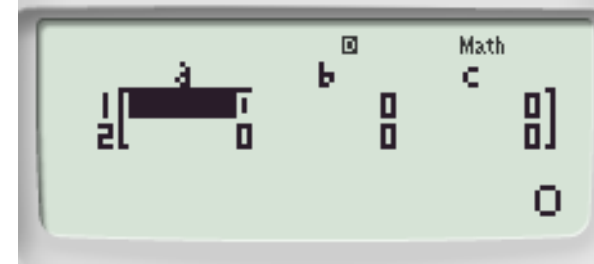
Solve for x and y: $3x + 2y = -8$ and $5x - 4y = -6$

③ = ② = − 8 = ⑤ = − 4 = − 6 =

= X= -2

= Y= -1
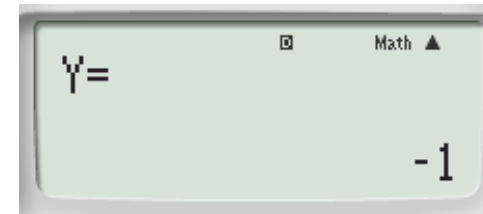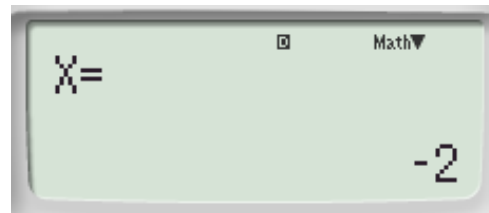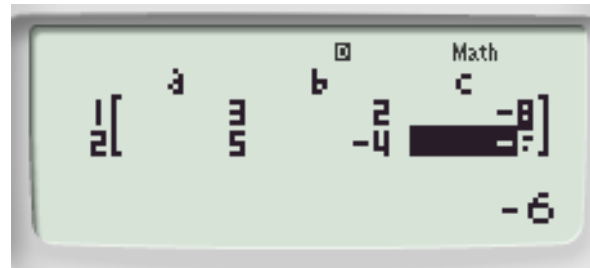
MODE 5 : EQN

Solving a CUBIC EQUATION

MODE 5 4
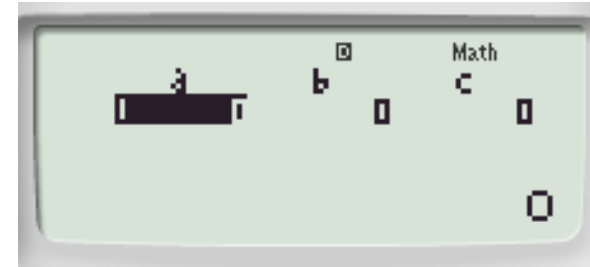
$$2x^3 + 3x^2 = 11x + 6$$
$$2x^3 + 3x^2 - 11x - 6 = 0$$

2 = 3 = − 1 1 = − 6 =

$X_1 =$ -3

$X_2 =$ 2
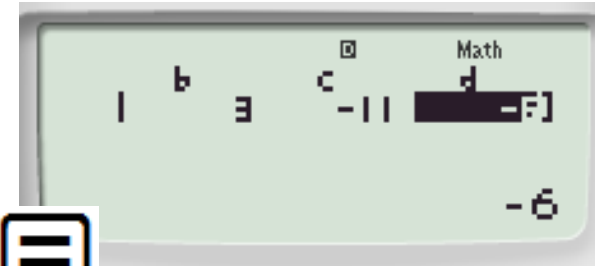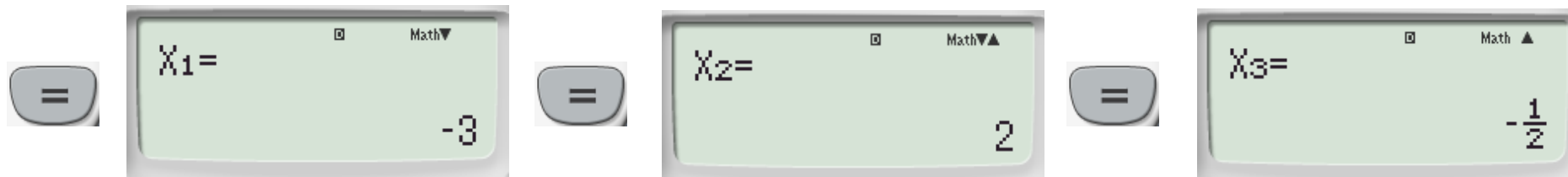
$X_3 =$ $-\frac{1}{2}$

Keep in mind then that the factors of this cubic function are: $(x_1 + 3)(x_2 - 2)(x_3 + \frac{1}{2})$

MODE 5 : EQN

Solving a
QUADRATIC EQUATION

[MODE] [5] [3]

$x^2 - x = 12$

$x^2 - x - 12 = 0$

[1] [=] [−] [1] [=] [−] [1] [2] [=]

X₁ =

$X_1 = 4$

X₂ =

$X_2 = -3$

X-Value Minimum=

$\frac{1}{2}$

Y-Value Minimum=

$-\frac{49}{4}$

CASIO means TECHNOLOGY
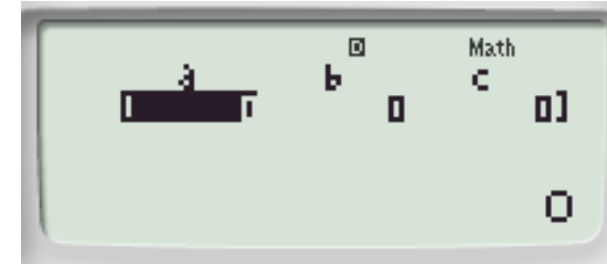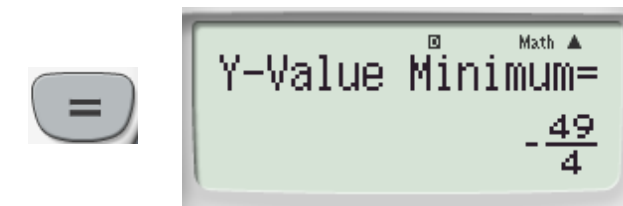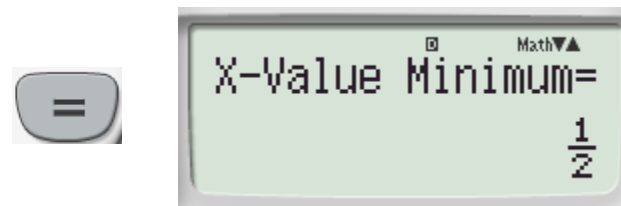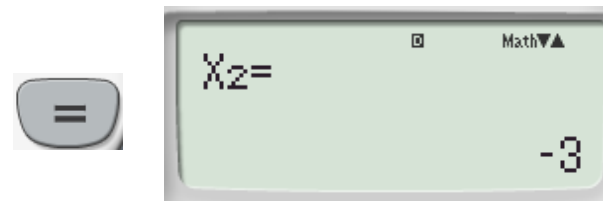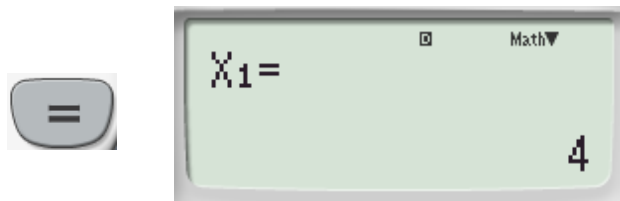
MODE 1 : COMP
Calculus

Integration

Find the area of the region bounded by the graphs
$f(x) = x^2 - x - 6$ and $g(x) = x - 3$

Step 1: Sketch graphs
$f(x) = x^2 - x - 6$ and $g(x) = x - 3$,
use <u>TABLE MODE</u> to help you

f

g

(-2 ; 0)

(3 ; 0)

(0 ; -6)
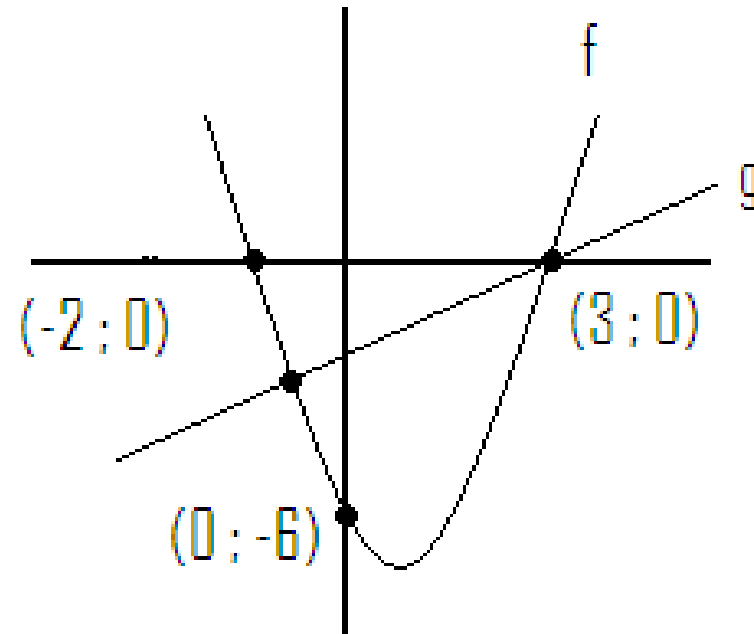
Step 2: Solve for the intersection of the two graphs

Using EQN MODE - 3: Quadratic equation

$$x^2 - x - 6 = x - 3$$
$$x^2 - 2x - 3 = 0$$

$x_1 = 3$ or $x_2 = -1$ Hence our interval is [-1 ; 3]

Step 3:
Set up the integral in COMP MODE

$$\int_{-1}^{3} (x - 3) - (x^2 - x - 6)dx$$
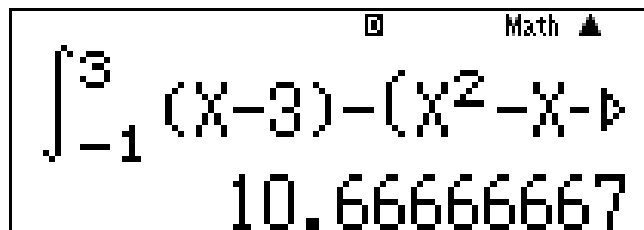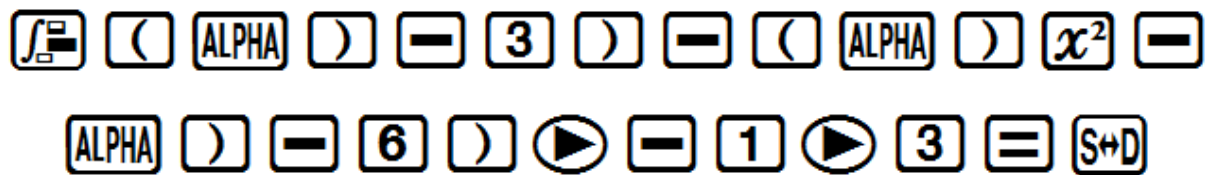
Area = 10,667 square units

Differentiation

Find the gradient of the graph
$y = 2x^2 + 2x - 5$, at $x = 1$

$$\frac{d}{dx} (2X^2 + 2X - 5) \bigg|_{x = 1}$$

SHIFT ▢ 2 ALPHA) x^2 + 2 ALPHA) − 5 ▶ 1 =

$$\frac{d}{dx}(2X^2 + 2X - 5)\big|_{x=1}$$

$$6$$

Gradient = 6

See the INSIDE COVER of the calculator:

Scientific Constants

[Shift] [7] (CONST) Number 01 – 40

Metric Conversions

[Shift] [8] (CONV) Number 01 – 40

[07]

1mile ▶km

[=]

1.609344

MODE 4 : BASE-N

MODE 4

x^3 DEC $\sqrt{\square}$ HEX $10^\square$ BIN $e^\square$ OCT
x^2 $x^\square$ log ln

Convert the decimal number 75 to binary	Convert the binary number 110001 to decimal
7 5 = log	110001 ... Dec 49
75 ... Bin 0000000001001011	1 1 0 0 0 1 = x^2
Add the following binary numbers: 1010+1111	Subtract the following binary numbers: 111-101
1010+1111 ... Bin 0000000000011001	111−101 ... Bin 0000000000000010
log 1 0 1 0 ⊞ 1 1 1 1 =	log 1 1 1 ⊟ 1 0 1 =
Multiply the following binary numbers: 101 x 11	Divide the following binary numbers: 1101÷11
101×11 ... Bin 0000000000001111	1101÷11 ... Bin 0000000000000100
log 1 0 1 ✖ 1 1 =	log 1 1 0 1 ÷ 1 1 =

MODE 2 : CMPLX (Complex Number)

```
         ▼
1:COMP    2:CMPLX
3:STAT    4:BASE-N
5:EQN     6:MATRIX
7:TABLE   8:VECTOR
```

MODE   2

CMPLX   ▣   Math

- Express $\sqrt{-16}$ in terms of i:

CMPLX   ▣   Math ▲

$\sqrt{-16}$

$\boxed{\sqrt{\Box}}$ $\boxed{-}$ $\boxed{1}$ $\boxed{6}$ $\boxed{=}$

4i

- Simplify i^5 :

CMPLX   ▣   Math ▲

i^5

$\boxed{\text{ENG}}$ $\boxed{x^{\Box}}$ $\boxed{5}$ $\boxed{=}$

i
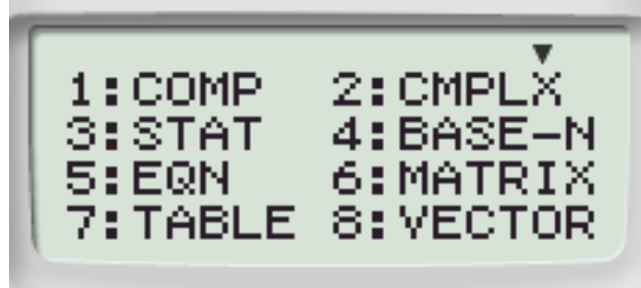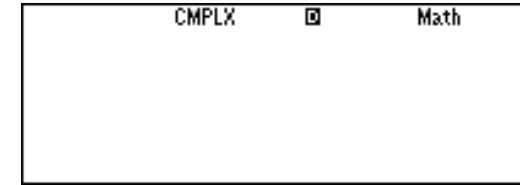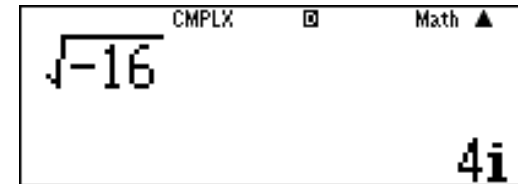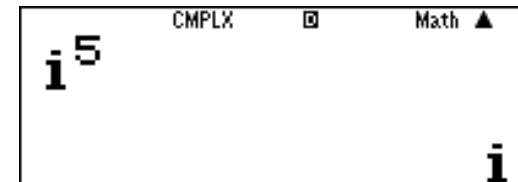
MODE 2 : CMPLX

- Simplify $(8 + 6i) + (3 + 2i)$:

  【(】 【8】 【+】 【6】 【ENG】 【)】 【+】

  【(】 【3】 【+】 【2】 【ENG】 【)】 【=】

  ```
  CMPLX        ▣      Math ▲
  (8+6i)+(3+2i)

                      11+8i
  ```

- Simplify $-4i(3 - 5i)$:

  【(−)】 【4】 【ENG】 【(】 【3】 【−】 【5】 【ENG】 【)】 【=】

  ```
  CMPLX        ▣      Math ▲
  -4i(3-5i)

                     -20-12i
  ```

- Simplify $\dfrac{-5+9i}{1-2i}$:

  【(】 【(−)】 【5】 【+】 【9】 【ENG】 【)】 【▤】 【1】 【−】 【2】 【ENG】 【=】

  ```
  CMPLX        ▣      Math ▲
  (-5+9i)
  ‾‾‾‾‾‾‾
  1-2i
                  - 23  _ 1 i
                     5    5
  ```

MODE 2 : CMPLX

Sub Menu   [CMPLX 2]   [SHIFT] [2]

```
1:arg    2:Conjg
3:▶r∠θ   4:▶a+bi
```

- Find the conjugate of -3 + 7i:

  [2] [(−)] [3] [+] [7] [ENG] [)] [=]

```
        CMPLX    ⊡      Math ▲
Conjg(-3+7i)

                    -3-7i
```

- Find the modulus & argument of $1 + i$:

  [1] [+] [ENG] [SHIFT] [2] [3] [=]

```
        CMPLX    ⊡      Math ▲
1+i▶r∠θ

                    √2∠45
```

ANGLES : COMP MODE

MODE

```
1:COMP   2:CMPLX
3:STAT   4:BASE-N
5:EQN    6:MATRIX
7:TABLE  8:VECTOR
```
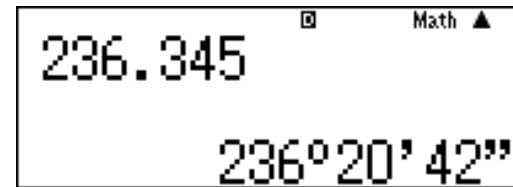
1

Math

°,,,
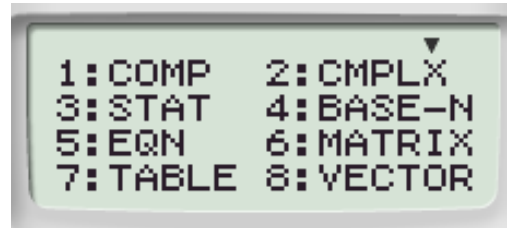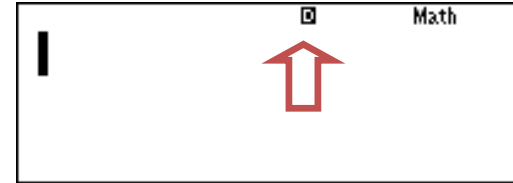
- **Converting from Decimal Degree notation to Degree-Minute-Second (D-M-S) notation:**

Express 236,345° in D-M-S notation:

2 3 6 • 3 4 5 = °,,,

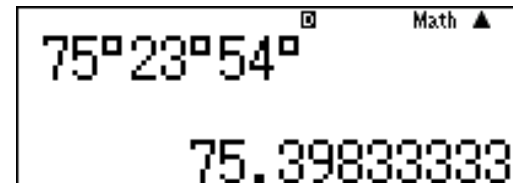```
236.345   Math ▲

                    236°20'42"
```
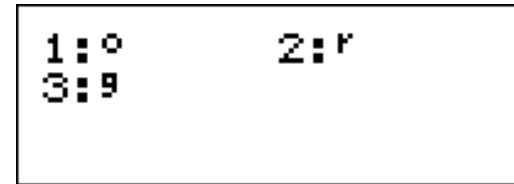
- **Converting from D-M-S notation to Decimal Degree notation:**

Express 75°23'54" in decimal degree notation:

7 5 °,,, 2 3 °,,, 5 4 °,,, = °,,,

```
75°23°54°                  Math ▲

                    75.39833333
```

ANGLES : COMP MODE

SHIFT   DRG ▶ PreAns   1:°   2:ʳ
         Ans   3:ᵍ

- **Converting from Radians to Degrees:**

Calculate the degree measure of 1,5 rad

[1] [•] [5] [SHIFT] [Ans] [2] [=]

1.5ʳ

85.94366927
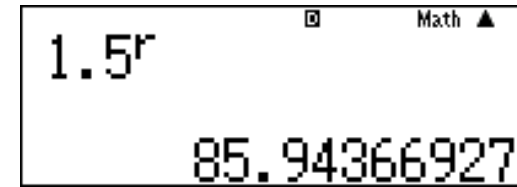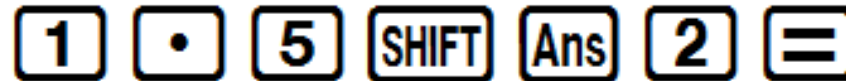
- **Converting from Degrees to Radians:**

SHIFT   MODE SETUP   1:MthIO 2:LineIO   [4]
                       3:Deg   4:Rad
                       5:Gra   6:Fix
                       7:Sci   8:Norm

Convert 120˚ to radians

[1] [2] [0] [SHIFT] [Ans] [1] [=]

120°

$\frac{2}{3}\pi$