

Ass

① What will be the remainder when  $2x^2 - 3x^2 - 3x - 2$  is divided by  $(2x - 3)$ ?

② Given  $p(x) = x^3 + 2x^2 + 5x + 4$  when  $a = 1$  Determine  $p(a)$  using the remainder theorem

If  $p(a) = 0$ , <sup>factor</sup>  $p(x) = (x - a) q(x)$

③ Find the value of  $k$  if  $p(x) = 3x - 2$   $(2x - k) - 8$  is divided by  $(x - 2)$  leaving remainder 4.

4) Find the value of  $m$ , if  $x = 1/2$  are the zeros of the polynomial  $p(x) = 4x^4 - 4x^3 - mx^2 + 12x - 3$

# Question 1

~~Ready Tutor~~

$2x^3 - 3x^2 - 3x - 2$  is divided by  $2x - 3$

**A**

$$\begin{array}{r}
 x^2 \\
 2x-3 \overline{) 2x^3 - 3x^2 - 3x - 2} \\
 \underline{2x^3 - 3x^2} \phantom{- 3x - 2} \\
 0 + 0 - 3x - 2 \rightarrow \text{Remainder}
 \end{array}$$

or (Continue with fraction numbers)

**B**

$$\begin{array}{r}
 x^2 - \frac{3}{2} \\
 2x-3 \overline{) 2x^3 - 3x^2 - 3x - 2} \\
 \underline{2x^3 - 3x^2} \phantom{- 3x - 2} \\
 0 + 0 - 3x - 2 \\
 \phantom{0 + 0 - 3x - 2} - 3x + \frac{9}{2} \\
 \phantom{0 + 0 - 3x - 2} \underline{\phantom{- 3x + \frac{9}{2}}} \\
 0 - \frac{13}{2} \rightarrow \text{Remainder}
 \end{array}$$

following the law of remainder theorem  
 $Q + \frac{R}{D}$ , where  $Q$  is quotient,  $R$  is Remainder  
and  $D$  is denominator.

For A,

$$x^2 + \frac{-3x - 2}{2x - 3}$$

for B,

$$x^2 - \frac{3}{2} + \frac{-13/2}{2x - 3}$$

$$x^2 - \frac{3}{2} - \frac{(13/2)}{(2x - 3)}$$

Note both answers are the same. Check your option for the best suit of examiner's mind.

## Question 2.

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$$p(x) = x^3 + 2x^2 + 5x + 4$$

Determine  $p(a)$  using the remainder theorem when  $a = -1$

Substitute  $x = -1$  into  $p(x)$

$$\begin{aligned}\therefore p(-1) &= (-1)^3 + 2(-1)^2 + 5(-1) + 4 \\ &= -1 + 2 - 5 + 4 \\ &= 0\end{aligned}$$

$\therefore$  when  $a = -1$ ,  $p(a) = 0$

## ~~Question 3~~

~~Find the value of  $k$  if  $p(x) = 3x - 2(x+1) + 8$  divided by  $(x-2)$  is~~

Continuation of Question 2,  
the question further states that if  $p(a) = 0$ ,  
factorize  $p(x) = (x-a)Q(x)$ ; where  $Q(x)$  is quotient

Recall that  $p(a) = 0$

$\therefore x-a$  is a factor

Hence divide  $p(x)$  by  $(x-a)$  to find  $Q(x)$

Since  $a = -1$ ,  $x - (-1)$ , therefore  $x+1$ .

$$p(x) = x^3 + 2x^2 + 5x + 4$$

$$(x-a) = x+1$$

$x^2 + x + 4$  → Quotient;  $Q(x)$

$$\begin{array}{r} x+1 \overline{) x^3 + 2x^2 + 5x + 4} \\ \underline{x^3 + x^2} \phantom{+ 4} \\ 0 + x^2 + 5x + 4 \\ \underline{x^2 + x} \phantom{+ 4} \\ 0 \phantom{+} 4x + 4 \\ \underline{4x + 4} \\ 0 \phantom{+} 0 \end{array}$$

Therefore  $Q(x) = x^2 + x + 4$

Compute;  $p(x) = (x-a) Q(x)$   
Hence,  $p(x) = (x+1)(x^2 + x + 4)$

### Question 3

Find the value of  $k$  if  $p(x) = 3x - 2(x - k) - 8$  is divided by  $(x-2)$  leaving remainder 4

Using the Remainder Theorem rule

Since  $x-2$  is divisible remain 4

$$\therefore p(2) = 4 \quad \dots \text{eqn (1)}$$

Recall  $p(x) = 3x - 2(x - k) - 8$   $\dots \text{eqn (2)}$

Substitute  $x$  for 2 in  $p(x)$

$$\therefore 3(2) - 2(2 - k) - 8 = 4$$

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$$6 - 4 + k - 8 = 4$$

$$6 - 4 - 8 + k = 4$$

$$-6 + k = 4$$

$$k = 4 + 6$$

$$k = 10$$

In otherwise, provided the equation <sup>was</sup> ~~is~~ mis placed  
note;  $k = 10$  for the equation  $3x - 2(x - k) - 8$   
if it's  $(3x - 2)(x - k) - 8$ , let consider the  
value of  $k$  here.

Substitute  $x$  for  $2$  in  $p(x)$

$$\therefore (3(2) - 2)(2 - k) - 8 = 4$$

$$(6 - 2)(2 - k) - 8 = 4$$

$$4(2 - k) - 8 = 4$$

$$8 - 4k - 8 = 4$$

$$-4k = 4$$

$$k = \frac{+4}{-4}$$

$$k = -1 //$$

Note; for  $p(x) = 3x - 2(x - k) - 8$   
the value of  $k = 10$  while  
for  $p(x) = (3x - 2)(x - k) - 8$   
the value of  $k = -1$

Question 4.

Find the value of  $m$ , if  $x = \frac{1}{2}$  are zeros of the polynomial  $p(x) = 4x^4 - 4x^3 - mx^2 + 12x - 3$

According to Remainder theorem rule, if  $x = \frac{1}{2}$  are zeros of the polynomial  $p(x)$ ,  
therefore  $p(\frac{1}{2}) = 0$

Substitute  $p(x)$  into  $p(\frac{1}{2})$

$$p(x) = 4\left(\frac{1}{2}\right)^4 - 4\left(\frac{1}{2}\right)^3 - m\left(\frac{1}{2}\right)^2 + 12\left(\frac{1}{2}\right) - 3 = 0$$

$$4\left(\frac{1}{16}\right) - 4\left(\frac{1}{8}\right) - m\left(\frac{1}{4}\right) + 12\left(\frac{1}{2}\right) - 3 = 0$$

$$\frac{1}{4} - \frac{1}{2} - \frac{m}{4} + 6 - 3 = 0$$

$$\frac{1}{4} - \frac{1}{2} - \frac{m}{4} + 3 = 0$$

$$\frac{1 - 2 - m + 12}{4} = 0$$

$$\frac{11 - m}{4} = 0$$

$$11 - m = 0$$

$m = 11$ . Therefore the value of  $m$  is

Solved by #AcetylTutor  
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