HW 4.4

March 8, 2015 2:56 PM

#3 d)

$4x^3 - 6x^2 - 2x - 3 > 6x^2 - x - 6$

$4x^3 - 12x^2 - x + 3 > 0$. look for the first root.

$x = 3$

$f(3) = 4(3)^3 - 12(3)^2 - 3 + 3$

$= 4(27) - 4(3)^3 - 3 + 3 = 0$ ✓ So $x=3$ is the 1st root.

$$\begin{array}{r|rrrr} 3 & 4 & -12 & -1 & 3 \\ & \downarrow & 12 & 0 & -3 \\ \hline & 4 & 0 & -1 & 0 \end{array}$$

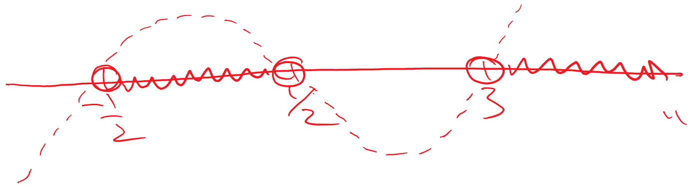
QUOTIENT:

$4x^2 - 1 = (2x-1)(2x+1)$

So the inequality can be written as:

$4x^3 - 6x^2 - 2x - 3 > 6x^2 - x - 6 \Longrightarrow (x-3)(2x-1)(2x+1) > 0$

② Now DRAW A Number line with all the roots



we want the domain where the graph is "above" the x-axis

So $\boxed{-\frac{1}{2} < x < \frac{1}{2} \quad \text{or} \quad 3 < x}$

3e) Solve the inequality:

$x^3 + 6x^2 - 9 \leq 2x^2 - x - 3$ move all the values to one side

$x^3 + 4x^2 + x - 6 \leq 0$ Now find the first factor / root

$x = 1$

$f(1) = 1 + 4 + 1 - 6 = 0$ ✓ is $(x-1)$ is a factor

$$\begin{array}{r|rrrr} 1 & 1 & 4 & 1 & -6 \\ & \downarrow & 1 & 5 & 6 \\ \hline & 1 & 5 & 6 & 0 \end{array}$$

QUOTIENT is

$x^2 + 5x + 6$

$(x+2)(x+3)$

Rewrite the inequality in factored form:

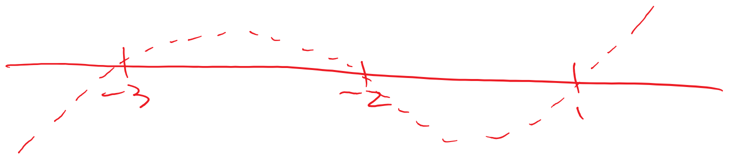
$x^3 + 6x^2 - 9 \leq 2x^2 - x - 3 \Longrightarrow (x-1)(x+2)(x+3) \leq 0$

Now DRAW THE NUMBER LINE:

we want the domain

factored form

NOW DRAW THE NUMBER LINE:



we want the domain when the graph is "below" the x-axis

$$\boxed{x \le -3 \text{ or } -2 \le x \le 1}$$

#5) To UNDERSTAND Q#5) HERE'S A HINT:

when we have an equation like

$$y = x^3 - 6x^2 + 11x - 6 = (x-1)(x-2)(x-3)$$

this last number is the negative product of all 3 roots.

ie: $x=1, x=2, x=3 \rightarrow -(1\times 2\times 3) = -6$

Note: the leading coefficient must be 1

So if we have

$$3x^5 + 4x^4 - 7x^3 + 9x^2 + 3x - 4 = 0$$

Divide both sides by 3 first

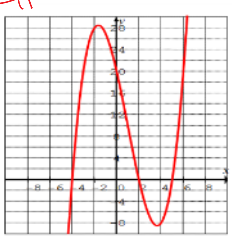
$$x^5 + \frac{4}{3}x^4 - \frac{7}{3}x^3 + 3x^2 + x - \frac{4}{3} = 0 = (x-a)(x-b)(x-c)(x-d)(x-e)$$

this constant will be the negative product of all 5 roots.

So $-\frac{4}{3} = -(a\times b\times c\times d\times e)$

$$\frac{4}{3} = a\times b\times c\times d\times e$$

#7



FOR THIS QUESTION, USE THE ROOTS to find the values of A, B, C in $y = Ax^3 + Bx^2 + Cx + 20$.

ROOTS ARE $x = -4, 2, 5$. y-int. is 20.

$y = a(x+4)(x-2)(x-5) \rightarrow y = \frac{1}{2}(x+4)(x-2)(x-5)$

$20 = a(4)(-2)(-5)$ $\quad y = \frac{1}{2}(x^3 - 3x^2 - 18x + 40)$

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$y = a(x+4)(x-2)(x-5)$

$20 = a(4)(-2)(-5)$

$\boxed{\frac{1}{2} = a}$

$y = \frac{1}{2}(x^3 - 3x^2 - 18x + 40)$

$\boxed{y = \frac{x^3}{2} - \frac{3}{2}x^2 - 9x + 20}$

$(x+4)(x-2)$
$x^2 + 4x - 2x - 8$
$(x^2 + 2x - 8)(x-5)$
$x^3 + 2x^2 - 8x$
$-5x^2 - 10x + 40$
$x^3 - 3x^2 - 18x + 40$

So $A = \frac{1}{2}$ $B = -\frac{3}{2}$ $C = -9$

Using the values, we can answer each True/False question