

The Remainder Theorem (3.2)

p124

day 3

Enneagram 3

Driven, loves to excel, success
Adaptable performers

Core longing: feel valuable
Core fear: being exposed/worthless
Deadly sin: deceit

Like attention, affirmation, being admired
Can deny their feelings

dad at garage

Can read a room very well
Competitive
Champion multi-taskers

13. A design team determines that a cost-efficient way of manufacturing cylindrical containers for their products is to have the volume, V , in cubic centimetres, modelled by $V(x) = 9\pi x^3 + 51\pi x^2 + 88\pi x + 48\pi$, where x is an integer such that $2 \leq x \leq 8$. The height, h , in centimetres, of each cylinder is a linear function given by $h(x) = x + 3$.

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:4#5ac, 13

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a) Determine the quotient $\frac{V(x)}{h(x)}$ and interpret this result.

b) Use your answer in part a) to express the volume of a container in the form $\pi r^2 h$.

c) What are the possible dimensions of the containers for the given values of x ?



$$V(x) = (x+3)(9\pi x^2 + 24\pi x + 16\pi)$$

$$(x+3)(\pi)(9x^2 + 24x + 16)$$

$$(x+3)\pi(3x+4)^2$$

5. Perform each division. Express in the form $\frac{P(x)}{x-a} = Q(x) + \frac{r}{x-a}$, any restrictions on the variable.

a) $(x^3 + 7x^2 - 3x + 4) \div (x + 1)$

b) $\frac{11t - 4t^2 - 7}{t - 3}$

c) $(x^3 + 3x^2 - 2x + 5) \div (x + 1)$

$$V = \pi r^2 h$$

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ex1: Given $f(x) = x^3 - 10x + 6$

a) evaluate $f(x) \div (x + 4)$

$$(x+4)(x-2) = 0$$

$$x = -4 \quad x = 2$$

b) evaluate $f(-4)$

$$f(-4) = (-4)^3 - 10(-4) + 6$$

$$= -64 + 40 + 6$$

$$= -18$$

$$\begin{array}{r} x^2 - 4x + 6 \\ x+4 \overline{) x^3 + 0x^2 - 10x + 6} \\ \underline{-x^3 + 4x^2} \\ -4x^2 - 10x \\ \underline{-4x^2 + 16x} \\ -6x + 6 \\ \underline{-6x + 24} \\ -18 \end{array}$$

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ex2: recall from yesterday:

$$f(x) = x^2 + 7x + 17 \div x + 3$$

was $x+4$ remainder 5

$$5x^3 - 13x^2 + 10x - 9 \div (x - 2)$$

was $5x^2 - 3x + 4$ remainder -1

Evaluate $f(-3)$

$$f(-3) = (-3)^2 + 7(-3) + 17$$

$$= 9 - 21 + 17$$

$$= 5$$

Evaluate $f(2)$

$$f(2) = 5(2)^3 - 13(2)^2 + 10(2) - 9$$

$$= 40 - 52 + 20 - 9$$

$$= -1$$

What do we notice?

$$\begin{array}{l} x+3 \\ \boxed{x^2 + 5x + 8} \\ x+2 \end{array}$$

$$\begin{array}{l} 6 \\ \boxed{26} \\ 4 \end{array}$$

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The Remainder Theorem:

When $f(x)$ is divided by $(x - a)$ the remainder is equal to $f(a)$

ex3: What is the remainder when the function is divided?

a) $f(x) = x^3 + 7x^2 - 3x + 4$ by $(x - 2)$

$$f(2) = 2^3 + 7(2)^2 - 3(2) + 4$$

$$= 8 + 28 - 6 + 4 = 34$$

b) $g(x) = x^3 + 3x^2 - 2x + 5$ by $(x + 1)$

$$g(-1) = (-1)^3 + 3(-1)^2 - 2(-1) + 5$$

$$= -1 + 3 + 2 + 5 = 9$$

c) $h(x) = 2x^3 + 3x^2 - 4x + 15$ by $(x + 3)$

$$h(-3) = 2(-3)^3 + 3(-3)^2 - 4(-3) + 15$$

$$= -54 + 27 + 12 + 15 = 0$$

6ace

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ex4: Solve

a) $3x^2 + 5x - 2 = 0$ $m=6$
 $a=3$ $b=5$ $c=-2$
 $3x^2 + 5x - 2 = 0$ $m=6$
 $3x(x+2) - 1(x+2) = 0$ $m=6$
 $(x+2)(3x-1) = 0$

$$3x(x+2) - 1(x+2) = 0$$

$$(x+2)(3x-1) = 0$$

$$x = -2 \quad x = \frac{1}{3}$$

b) $2x^2 + 3x - 1 = 0$ $m=2$
 $a=2$ $b=3$ $c=-1$
 $x = \frac{-3 \pm \sqrt{9 - 4(2)(-1)}}{2(2)}$

$$= \frac{-3 \pm \sqrt{17}}{4}$$

$$x = 0.28 \quad x = -1.78$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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HW: p124 #7ac, 8ab, 11