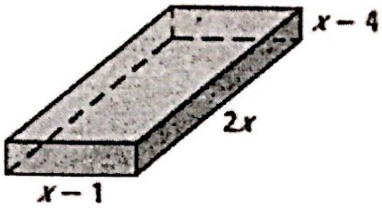
# GUIDED NOTES: Polynomial Applications

EX1. For 1985 through 1996, the number, $C$ (in millions), of videos rented each year in the United States can be modeled by $C = 0.053\left(t^3 + 2t^2 + 33t + 500\right)$, where $t = 0$ represents 1990. Using this model, estimate the number of videos rented in the United States in 1994.

EX2. The profit $P$ (in millions of dollars) for a manufacturer of MP3 players can be modeled by $P = -4x^3 + 12x^2 + 16x$, where $x$ is the number of MP3 players produced (in millions). Currently, the company produces 3 million MP3 players and makes a profit of $48,000,000. What lesser number of MP3 players could the company produce and still make the same profit?

EX3. Given that the volume of the box is 40 in$^3$, determine the dimensions of the box.




EX4. A rectangular pool has a length of $x^2 + 9x + 3$ feet and a width of $4x - 2$ feet. Determine the area of the pool.

EX5. A rectangular Tyrannosaurus Rex paddock has an area of $x^3 + x^2 - 11x + 4$ square meters, and a width of $x + 4$ meters. Find its length.

① $t = 4$

$$C = 0.053\left(4^3 + 2(4)^2 + 3(4) + 500\right)$$

$= 32$ million

videos rented in 1994

② $48 = -4x^3 + 12x^2 + 16x$

$-48 \qquad\qquad -48$

$0 = -4x^3 + 12x^2 + 16x - 48$

zeros: $x = 3$, $x = 2$, $\cancel{x = -2}$

It doesn't make sense in this context

I could produce 2 million MP3 players and make a profit of \$48 million.

③ $2x(x-1)(x-4) = 40$

$2x(x-1)(x-4) - 40 = 0$

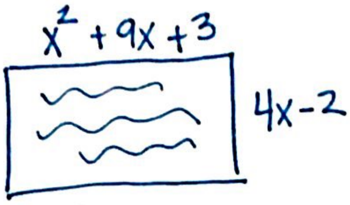
zero: $x = 5$

$2(5)(5-1)(5-4) \overset{??}{=} 40$

$10(4)(1) \overset{??}{=} 40$ ✓

$\boxed{10\text{in}, 4\text{in}, 1\text{in}}$

4)



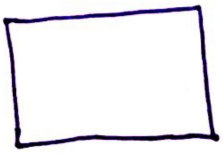

$A = lw$

$A = (x^2 + 9x + 3)(4x - 2)$

$= 4x^3 - 2x^2 + 36x^2 - 18x + 12x - 6$

$= \boxed{4x^3 + 34x^2 - 6x - 6}$ feet²

5)



$A = lw$

$$\frac{x^3 + x^2 - 11x + 4}{(x+4)} = \frac{l\,(x+4)}{(x+4)}$$

$$\begin{array}{r|rrrr} -4 & 1 & 1 & -11 & 4 \\ & \downarrow & -4 & 12 & -4 \\ \hline & 1 & -3 & 1 & 0 \end{array}$$

$\boxed{\text{length: } x^2 - 3x + 1 \text{ meters}}$

NAME ______________________________________________

**Average Rate of Change**

1. Find the average rate of change from ***x* = – *1*** to ***x* = *2*** for each of the functions below.

   a. $a(x) = 2x + 3$    b. $b(x) = x^2 - 1$    c. $c(x) = 2^x + 1$

   d. Which function has the greatest average rate of change over the interval **[ – 1, 2]**?

2. Find the average rate of change on the interval **[ 2, 5]** for each of the functions below.

   a. $a(x) = 2x + 1$    b. $b(x) = x^2 + 2$    c. $c(x) = 2^x - 1$

$m = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$ * I need two coordinates

a) $a(-1) = 2(-1)+3 = 1$

$a(2) = 2(2)+3 = 7$

$(-1, 1) \quad (2, 7)$

$m = \frac{7-1}{2-(-1)} = \frac{6}{3} = 2$

b) $b(-1) = (-1)^2 - 1 = 0$

$b(2) = (2)^2 - 1 = 3$

$(-1, 0) \quad (2, 3)$

$m = \frac{3-0}{2-(-1)} = \frac{3}{3} = 1$

c) $c(-1) = 2^{-1} + 1 = 1.5$

$c(2) = 2^2 + 1 = 5$

$(-1, 1.5) \quad (2, 5)$

$m = \frac{5-1.5}{2-(-1)} = \frac{3.5}{3} \approx 1.17$