

## 5.2 Application and Extension

1. Use long division.  $(a^3 + 5a^2 + 10a + 2) \div (a + 2)$

$$= a^2 + 3a + 4 + \frac{-6}{a+2}$$

$$\begin{array}{r} a^2 + 3a + 4 + \frac{-6}{a+2} \\ a+2 \overline{) a^3 + 5a^2 + 10a + 2} \\ \underline{+ (-a^3 - 2a^2)} \phantom{+ 10a + 2} \\ 3a^2 + 10a + 2 \\ \underline{+ (-3a^2 - 6a)} \phantom{+ 2} \\ 4a + 2 \\ \underline{+ (-4a - 8)} \\ -6 \end{array}$$

2. Is  $(k + 8)$  a factor of  $(k^4 - 50k^2 - 16k + 1)$ ?

$$(k - -8)$$

$$f(k) = k^4 - 50k^2 - 16k + 1$$

$$f(-8) = (-8)^4 - 50(-8)^2 - 16(-8) + 1$$

$$= 4096 - 50(64) + 128 + 1$$

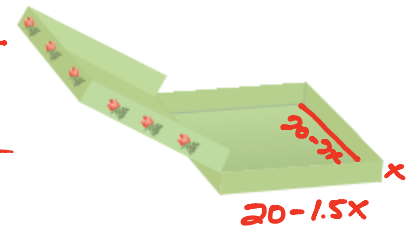
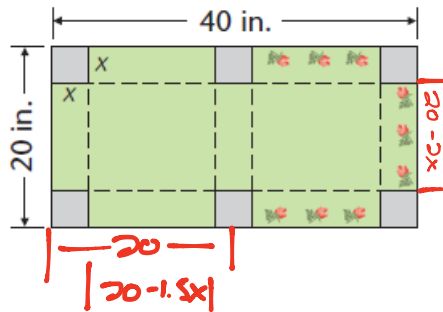
$$= 4096 - 3200 + 129$$

$$f(-8) = 1025$$

$\therefore$  Since  $f(-8) \neq 0$ ,  $(x+8)$  is not a factor of  $k^4 - 50k^2 - 16k + 1$

3. During Mr. Brust's annual visit to the scrapbooking convention, he took a 20 by 40 inch piece of cardboard and put pretty flowers on it. He then realized it was possible to make a box with a hinged lid by cutting out six squares,  $x$  inches on a side from each corner and the middle, and then the ends and sides will be folded up to form the box and its lid (see figure). We want the box to have a volume of 625 cubic inches. One possible solution would be if the cutout was 5 inches. What other value of  $x$  would result in a box with a volume of 625 cubic inches. (Hint: you will need to use the quadratic formula at some point.)

$$\begin{aligned} V &= A_{\text{base}} \cdot h \\ 625 &= (20 - 1.5x)(20 - 2x)x \\ &= (400 - 40x - 30x + 3x^2)x \\ &= (400 - 70x + 3x^2)x \\ 625 &= 400x - 70x^2 + 3x^3 \\ 0 &= 3x^3 - 70x^2 + 400x - 625 \end{aligned}$$



CANT FACTOR

Since "5" is a factor...

$$\begin{array}{r} 5 \overline{) 3 \quad -70 \quad 400 \quad -625} \\ \underline{\phantom{5} 15 \quad -275 \quad 625} \\ 3 \quad -55 \quad 125 \quad \boxed{0} \end{array}$$

$$(x-5)(3x^2 - 55x + 125) = 0$$

$$x-5=0$$

$$x=5$$

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

$$x = \frac{-(-55) \pm \sqrt{(-55)^2 - 4(3)(125)}}{2(3)}$$

$$x = \frac{55 \pm \sqrt{3025 - 1500}}{6}$$

$$x = \frac{55 \pm \sqrt{1525}}{6}$$

$$x = \frac{55 \pm 5\sqrt{61}}{6}$$

$$x = 15.675, 2.658$$

$x \neq 15.625$ , because it would cut the paper in half.

So,  $x = 2.658$  inches.