Skillz Review: Find the x- and y-intercepts for each function. SHOW ALL WORK!

1. $-3x + y = -7$

x-int: $\frac{7}{3}$ y-int: -7

$-3x + (0) = -7$
$-3x = -7$
$x = \frac{7}{3}$

$-3(0) + y = -7$
$y = -7$

2. $f(x) = \frac{x^2+2x}{2x^2-2x-4}$

x-int: $-2, 0$ y-int: 0

$0 = \frac{x^2+2x}{2x^2-2x-4}$
$0 = x^2 + 2x$
$0 = x(x+2)$
$0 = x$; $0 = x+2$, $-2 = x$

$y = \frac{(0)^2+2(0)}{2(0)^2-2(0)-4}$
$= \frac{0+0}{0-0-4}$
$= \frac{0}{-4}$
$y = 0$

5.1 Application and Extension

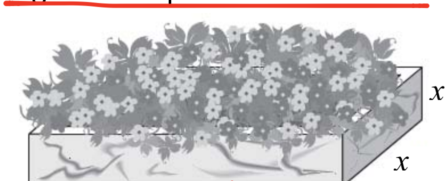
1. Factor: $21x^8 - 117x^4 - 210$

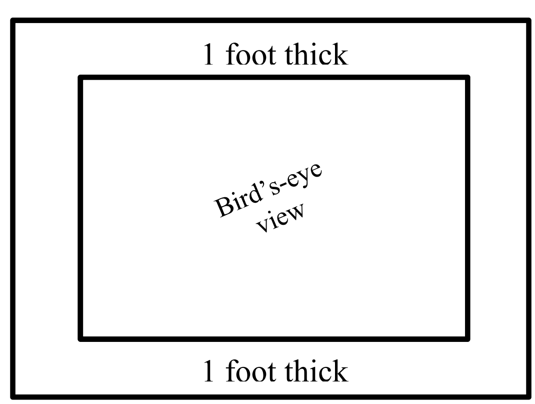
$= 3(7x^8 - 39x^4 - 70)$
$= 3[7x^8 - 49x^4 + 10x^4 - 70]$
$= 3[7x^4(x^4-7) + 10(x^4-7)]$
$= 3(x^4-7)(7x^4+10)$

2. Find ALL solutions: $(x^3 - 5x^2) + (4x - 20) = 0$

$x^2(x-5) + 4(x-5) = 0$
$(x-5)(x^2+4) = 0$
$x-5=0$; $x^2+4=0$
$x=5$; $x^2=-4$
$x = \pm 2i$
$x = 5, \pm 2i$

3. You are designing several marble planters for a city park. You want the length of the planter to be 1 foot longer than the width, and the height to be the same as the width (the picture is not to scale). The sides should be one foot thick. Because the planter will be on the sidewalk, it does not need a bottom. What should the outer dimensions of the planter be if it is to hold 6 cubic feet of dirt? (Solve using methods of factoring).





① Outside Dimensions ④
width = x = 3
length = $x+1$ = (3)+1 = 4
height = x = 3

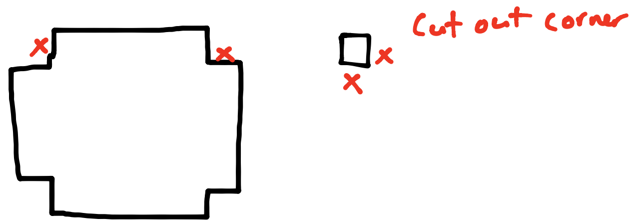
② INSIDE DIMENSIONS ⑤
width = $x-2$ = (3)−2 = 1
length = $x+1-2 = x-1$ = (3)−1 = 2
height = x = 3

③ $V = lwh$
$V = (x-1)(x-2)x$
$6 = x^3 - 3x^2 + 2x$
$0 = x^3 - 3x^2 + 2x - 6$
$0 = x^2(x-3) + 2(x-3)$
$0 = (x-3)(x^2+2)$
$0 = x-3$; $0 = x^2+2$
$3 = x$; $-2 = x^2$
$\pm i\sqrt{2} = x$ → makes no sense for a dimension.

⑥ The outer dimensions should have a width and height of 3 feet and a length of 4 feet.

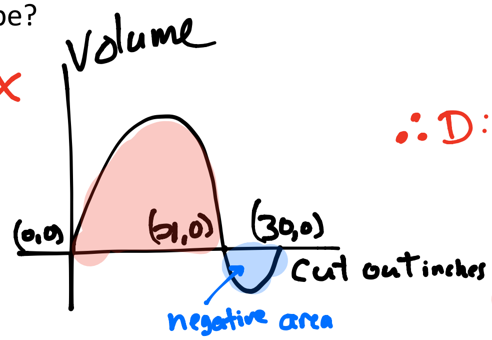
4. A rectangular sheet of material can be used to form an open box by cutting out square inches from all four corners and then folding up the sides. Each square that is removed has a width x. The possible volume of this box is given by $V(x) = x^3 - 51x^2 + 630x$.

   a. Draw the sheet of material with the cut out corners.



   b. Factor the equation, and use the factors along with the graph (on a calculator) to determine the relevant domain for this scenario. (x is measured in inches). In other words, what is the smallest and largest the cutout squares can be?

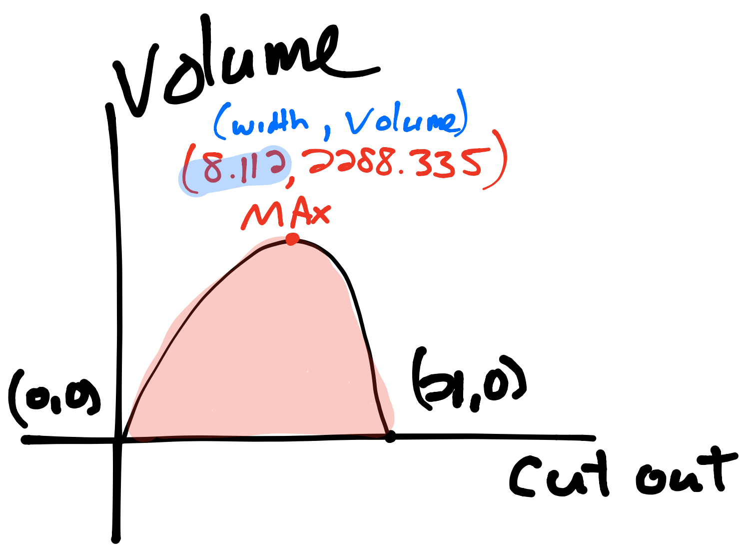
$$V(x) = x^3 - 51x^2 + 630x$$
$$= x(x^2 - 51x + 630)$$
$$= x(x-21)(x-30)$$
$$V(x) = x(x-21)(x-30)$$



$\therefore D: (0, 21)$

Smallest cut is > 0
Largest cut is < 21

   c. How large should the cut out be to give the box the largest possible volume? (Use the graphing calculator to find this.)



The cut out should be 8.112 inches to maximize the volume.