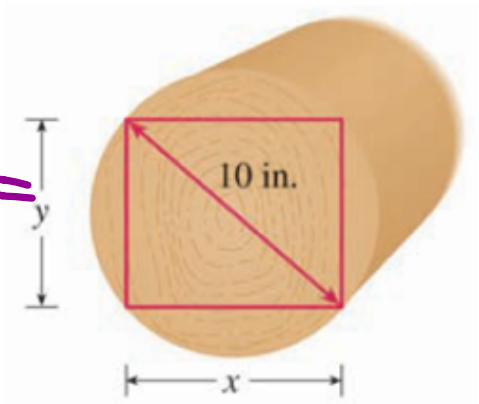
11. The strength S of a wooden beam of width x and depth y is given by the formula $S = 13.8xy^2$. A beam is to be cut from a log of diameter 10 in., as shown in the figure.

(a) Express the strength S of this beam as a function of x only.

(b) What is the domain of the function S?

(c) Draw a graph of S.

(d) What width will make the beam the strongest?

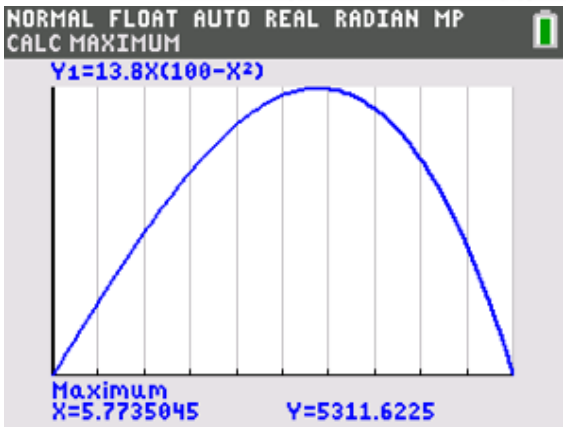


$\sqrt{100-x^2} = y$

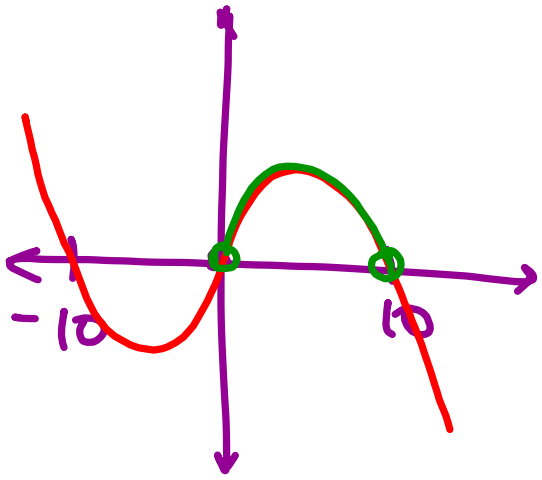
$S = 13.8x(100-x^2)$

$0 < x < 10$

x-int: $0, \pm 10$



$x = 5.774$



19. $\dfrac{2x^3 + x^2 - 8x + 15}{x^2 + 2x - 1}$ $= 2x - 3 + \dfrac{12}{x^2+2x-1}$

$$
\begin{array}{r}
2x - 3 \\
x^2+2x-1 \overline{)\,2x^3+x^2-8x+15} \\
\underline{2x^3+4x^2-2x} \\
-3x^2-6x+15 \\
\underline{-3x^2-6x+3} \\
12
\end{array}
$$

19. $\dfrac{2x^3 + x^2 - 8x + 15}{x^2 + 2x - 1}$

$x^2 + 2x - 1 = 0$ $\quad x = -1 \pm \sqrt{2}$

$x^2 + 2x + 1 = 2$ $\quad (x - (-1+\sqrt{2}))(x - (-1-\sqrt{2}))$

$(x+1)^2 = 2$

$x + 1 = \pm\sqrt{2}$

$-1+\sqrt{2}$	2	1	-8	15
	↓	$-2+2\sqrt{2}$	$5-3\sqrt{2}$	-3
$-1-\sqrt{2}$	2	$-1+2\sqrt{2}$	$-3-3\sqrt{2}$	12
		$-2-2\sqrt{2}$	$3+3\sqrt{2}$	
	2	-3	0	

7. $P(x) = x^3 - 4x + 1$

$\frac{\pm 1}{\pm 1} \ni \pm 1$

r: a factor of $\frac{K}{a}$,

$ax^n + bx^{n-1} + cx^{n-2} + \cdots + K$

$$\frac{2x^3-5x^2+7}{x^2-2x-3}$$

$$\begin{array}{r} 2x-1 \\ x^2-2x-3 \overline{)\,2x^3-5x^2+0x+7} \\ \underline{2x^3-4x^2-6x} \\ -x^2+6x+7 \\ \underline{-x^2+2x+3} \\ 4x+4 \end{array}$$

$$\frac{2x^3-5x^2+7}{x^2-2x-3}$$

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

$x \Rightarrow 3, -1$

$2x^3-5x$

3 | 2 −5 0 7
↓ 6 3 9
2 1 3 | 16

−1 | −2 1
2 −1 | 4