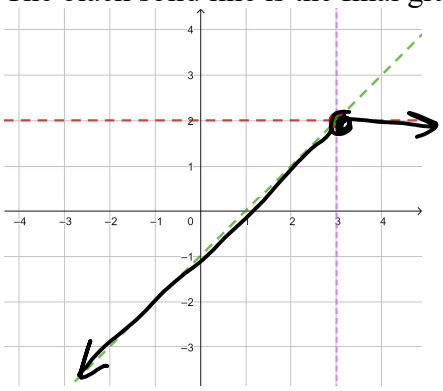
2.6 # 21, 23, 27, 29, 31, 51

In 21-31 Purple vertical lines show where to switch from one graph to the other.

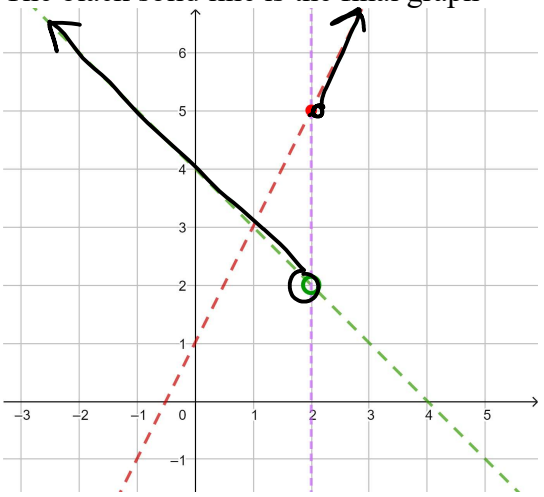
21. $f(x) = \begin{cases} x - 1 & \text{if } x \le 3 \\ 2 & \text{if } x > 3 \end{cases}$

dashed lines show the steps:
red is the line y=2, green is y=x-1.
The black solid line is the final graph



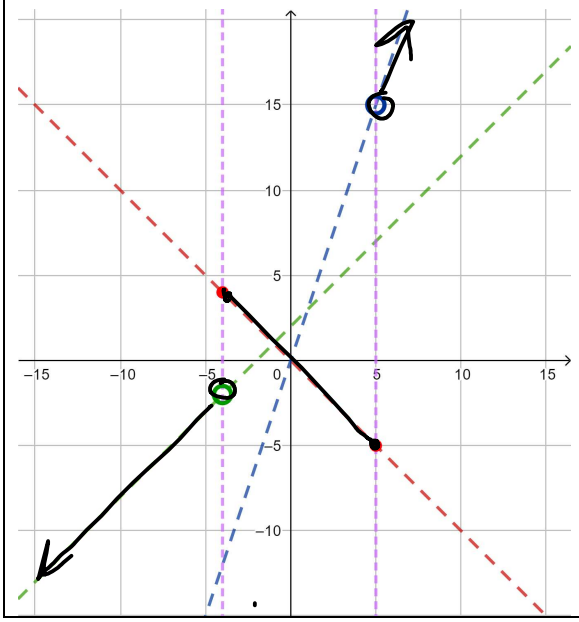
23. $f(x) = \begin{cases} 4 - x & \text{if } x < 2 \\ 1 + 2x & \text{if } x \ge 2 \end{cases}$

dashed lines show the steps:
green is the line y=4-x, red is y=1+2x.
The black solid line is the final graph



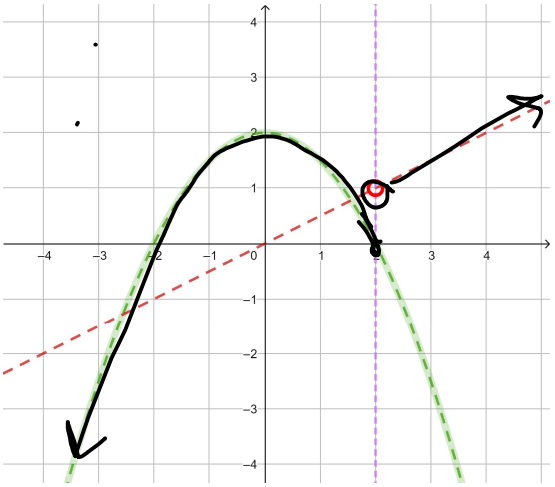
27. $f(x) = \begin{cases} 2 + x & \text{if } x < -4 \\ -x & \text{if } -4 \le x \le 5 \\ 3x & \text{if } x > 5 \end{cases}$

Dashed lines show the steps:
green is the line y=2+x, red is y=-x, blue is y=3x.
The black solid line is the final graph



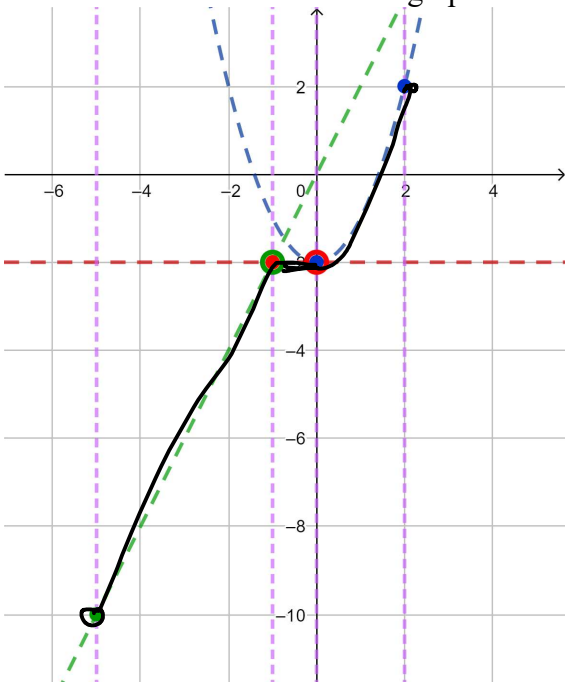
29. $f(x) = \begin{cases} -\frac{1}{2}x^2 + 2 & \text{if } x \le 2 \\ \frac{1}{2}x & \text{if } x > 2 \end{cases}$

Dashed lines show the steps:
green is the parabola y=-(1/2)x^2+2, red is y=-(1/2)x
The black solid line is the final graph



31. $f(x) = \begin{cases} 2x & \text{if } -5 \le x < -1 \\ -2 & \text{if } -1 \le x < 0 \\ x^2 - 2 & \text{if } 0 \le x \le 2 \end{cases}$

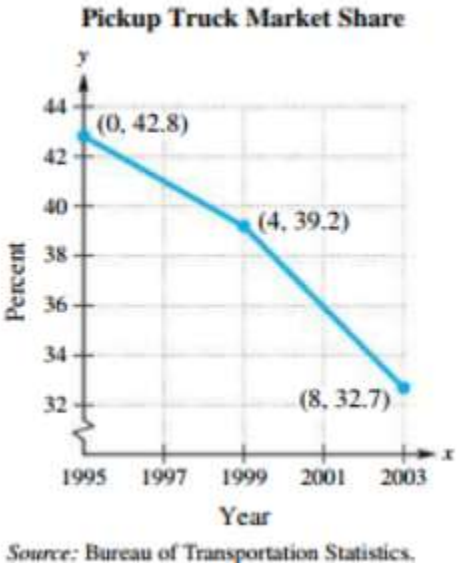
Dashed lines show the steps:
green is the line y=2x, red is y=-2, blue is y=x^2-2
The black solid line is the final graph



51. ***Pickup Truck Market Share*** The light vehicle market share (in percent) in the United States for pickup trucks is shown in the graph. Let $x = 0$ represent 1995, $x = 4$ represent 1999, and so on.

(a) Use the points on the graph to write equations for the line segments in the intervals $[0, 4]$ and $(4, 8]$.

(b) Define this graph as a piecewise-defined function f.



Source: Bureau of Transportation Statistics.

To find the equation of a line between (0,42.8) and (4,39.2) , calculate:

$$m = \frac{39.2 - 42.8}{4 - 0} = \frac{-3.6}{4} = -0.9$$

$$y - 42.8 = -0.9(x - 0)$$

$$y = -0.9 + 42.8$$

To find the equation of a line between (4,39.2) and (8,32.7), calculate:

$$m = \frac{32.7 - 39.2}{8 - 4} = \frac{-6.5}{4} = -1.625$$

$$y - 32.7 = -1.625(x - 8)$$

$$y - 32.7 = -1.625x + 13$$

$$y = -1.625x + 45.7$$

Put the equations together like this:

$$y = \begin{cases} -0.9x + 42.8 & \text{if } 0 \le x \le 4 \\ -1.625x + 45.7 & \text{if } 4 < x \le 8 \end{cases}$$

Because the two equations have the same value when x=4, it's OK if you have <4 for the first one and $4 \le x$ on the second one.

2.7 # 79, 81, 83

79. This graph is an y=|x| equation that is flipped upside down, is not stretched, and has the center moved to
(-1,4), so the equation is $y = -|x+1|+4$

81. This graph is a shifted square root graph. It is not stretched or reflected. Its center is at (1,-3), so the equation is $y = \sqrt{x-1} - 3$

83. This graph is a square root that is shifted and stretched. If you start at the center (-4,-4) and go right 1, the graph goes up by 2, so it is stretched by 2. This means the equation is: $y = 2\sqrt{x+4} - 4$