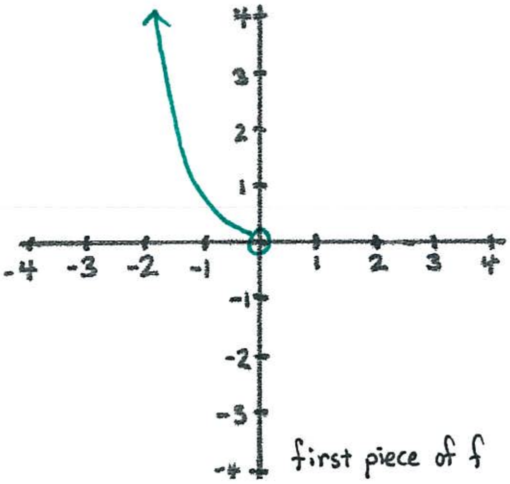
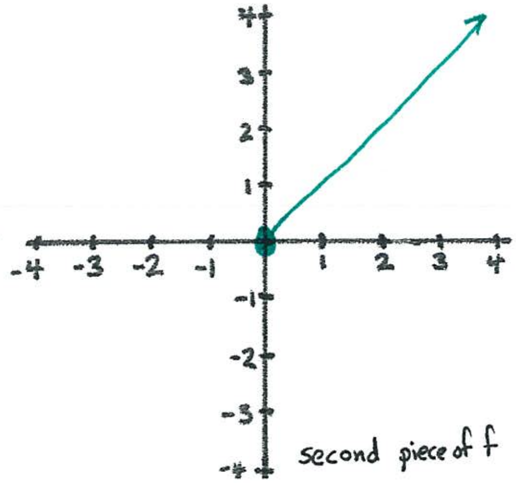
$$f(x)=\begin{cases} x^2 & \text{if } x\in(-\infty,0) \\ x & \text{if } x\in[0,\infty) \end{cases}$$


first piece of f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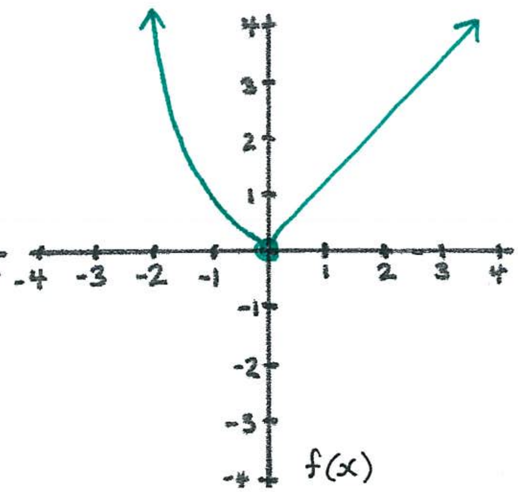
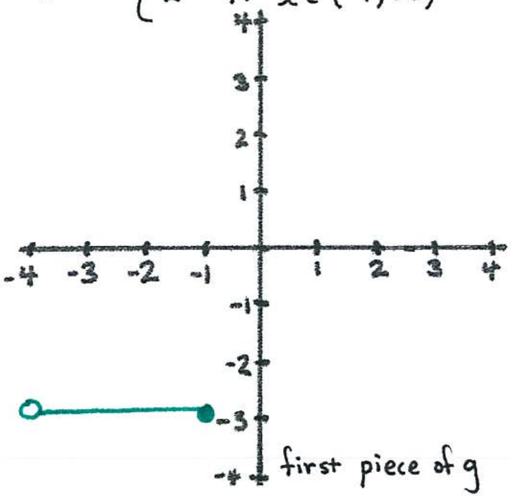
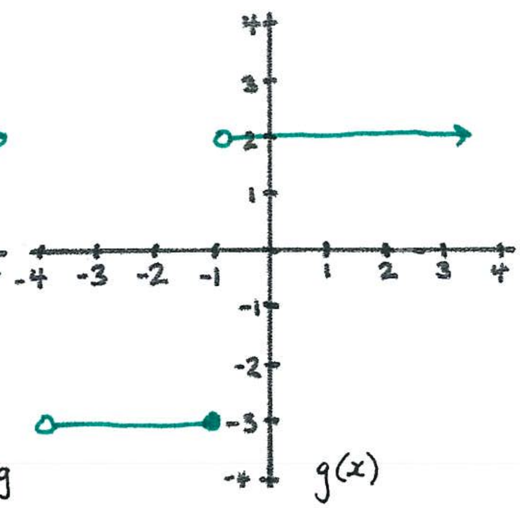

$f(x)$

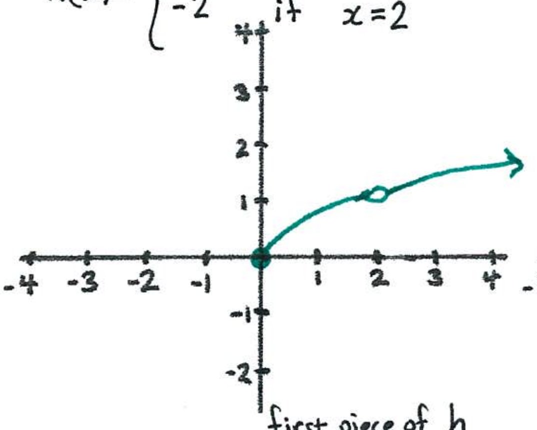
$$g(x)=\begin{cases} -3 & \text{if } x\in(-4,-1] \\ 2 & \text{if } x\in(-1,\infty) \end{cases}$$

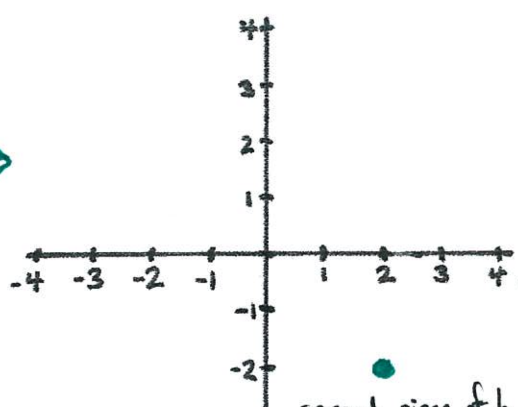

first piece of g


second piece of g


$g(x)$

$$h(x)=\begin{cases} \sqrt[2]{x} & \text{if } x\neq 2 \\ -2 & \text{if } x=2 \end{cases}$$


first piece of h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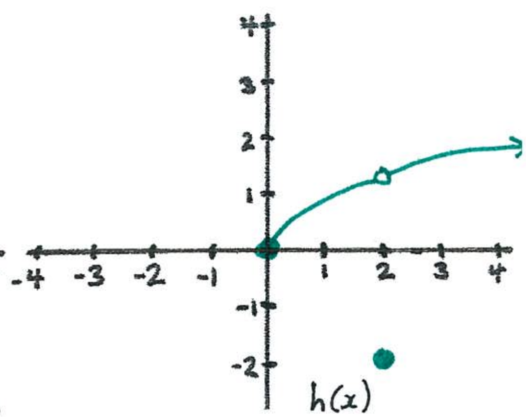
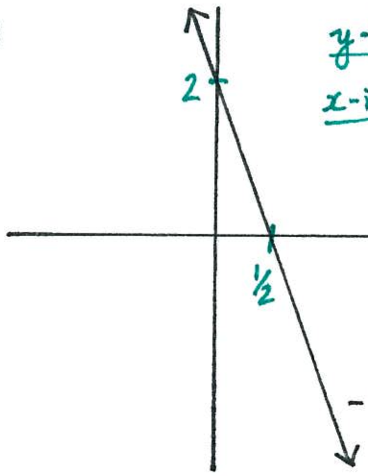

$h(x)$

For #1-4, label all y-intercepts and x-intercepts.

①



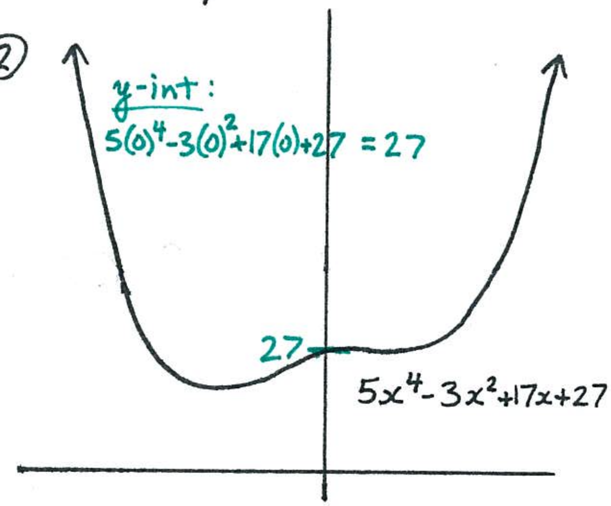
y-int: $-4(0)+2=2$

x-int: $-4x+2=0$

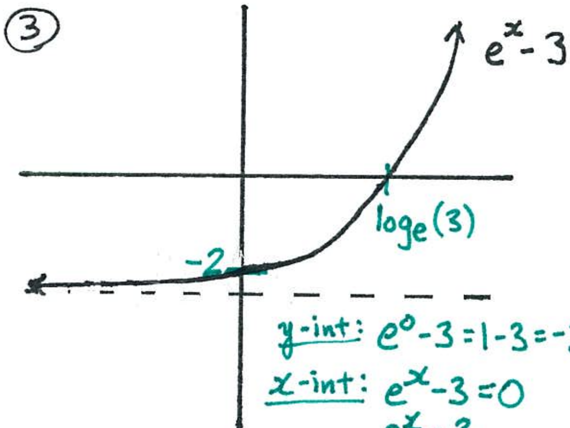
$-4x=-2$

$x=\frac{-2}{-4}=\frac{1}{2}$

②



③



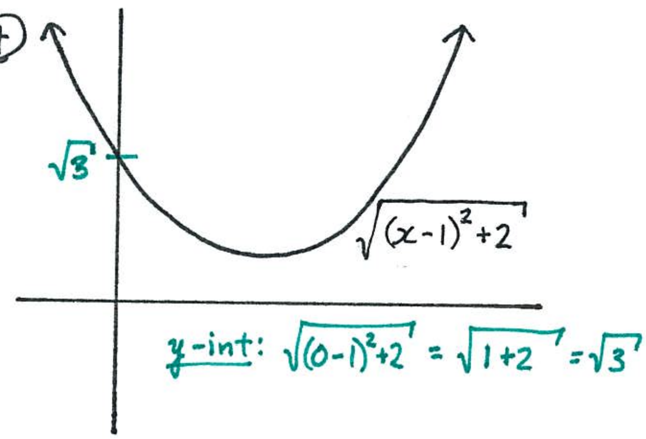
y-int: $e^0-3=1-3=-2$

x-int: $e^x-3=0$

$e^x=3$

$x=\log_e(3)$

④



y-int: $\sqrt{(0-1)^2+2}=\sqrt{1+2}=\sqrt{3}$

---

⑤ Solve for x if $|2x+1|<5$.

$-5<2x+1<5$

$-6<2x<4$

$-3<x<2$

⑥ Solve for x if $|3-4x|<1$.

$-1<3-4x<1$

$-4<-4x<-2$

$\frac{-4}{-4}>x>\frac{-2}{-4}$

$1>x>\frac{1}{2}$

Linear Algebra

⑦ $\det\begin{pmatrix}3 & 2\\ 1 & -1\end{pmatrix} = (3)(-1)-(1)(2) = -3-2 = -5$

⑧ $\begin{pmatrix}3 & 2\\ 1 & -1\end{pmatrix}^{-1} = \dfrac{1}{\det\begin{pmatrix}3 & 2\\ 1 & -1\end{pmatrix}}\begin{pmatrix}-1 & -2\\ -1 & 3\end{pmatrix} = \dfrac{1}{-5}\begin{pmatrix}-1 & -2\\ -1 & 3\end{pmatrix} = \begin{pmatrix}1/5 & 2/5\\ 1/5 & -3/5\end{pmatrix}$

⑨ $\begin{pmatrix}3 & 2\\ 1 & -1\end{pmatrix}^{-1}\begin{pmatrix}3 & 2\\ 1 & -1\end{pmatrix} = \begin{pmatrix}1/5 & 2/5\\ 1/5 & -3/5\end{pmatrix}\begin{pmatrix}3 & 2\\ 1 & -1\end{pmatrix} = \begin{pmatrix}3/5+2/5 & 2/5-2/5\\ 3/5-3/5 & 2/5+3/5\end{pmatrix}$

$= \begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}$

⑩ Write the following system of equations as a single matrix equation.

$$\begin{cases} -x+2y-z=0\\ -2x+2y-z=1\\ 3x-y+z=-1\end{cases} \qquad \begin{pmatrix}-1 & 2 & -1\\ -2 & 2 & -1\\ 3 & -1 & 1\end{pmatrix}\begin{pmatrix}x\\ y\\ z\end{pmatrix} = \begin{pmatrix}0\\ 1\\ -1\end{pmatrix}$$

⑪ Solve for $x, y,$ and z in the above system. Use that

$$\begin{pmatrix}-1 & 2 & -1\\ -2 & 2 & -1\\ 3 & -1 & 1\end{pmatrix}^{-1} = \begin{pmatrix}1 & -1 & 0\\ -1 & 2 & 1\\ -4 & 5 & 2\end{pmatrix}$$

$x=-1$, $y=1$, and $z=3$

$$\begin{pmatrix}x\\ y\\ z\end{pmatrix} = \begin{pmatrix}-1 & 2 & -1\\ -2 & 2 & -1\\ 3 & -1 & 1\end{pmatrix}^{-1}\begin{pmatrix}0\\ 1\\ -1\end{pmatrix} = \begin{pmatrix}1 & -1 & 0\\ -1 & 2 & 1\\ -4 & 5 & 2\end{pmatrix}\begin{pmatrix}0\\ 1\\ -1\end{pmatrix} = \begin{pmatrix}(-1)(1)\\ (2)(1)+(1)(-1)\\ (5)(1)+(2)(-1)\end{pmatrix} = \begin{pmatrix}-1\\ 1\\ 3\end{pmatrix}$$

checking your work

(12) Is $x = e^{5/3}$ a solution to the equation

$$\log_e(x^4) - \log_e(x) - 3 = 2 \ ?$$

$$\log_e((e^{5/3})^4) - \log_e(e^{5/3}) - 3 = \log_e(e^{20/3}) - \log_e(e^{5/3}) - 3$$

$$= 20/3 - 5/3 - 3$$

$$= 20/3 - 5/3 - 9/3$$

$$= \frac{20-5-9}{3} = 6/3 = 2$$

Yes, $x = e^{5/3}$ is a solution.

(13) Is $x = \log_e(2) + 3$ a solution to the equation

$$4e^{x-3} = 8 \ ?$$

$$4e^{(\log_e(2)+3)-3} = 4e^{\log_e(2)} = 4(2) = 8.$$

Yes, $x = \log_e(2) + 3$ is a solution.

P.S. Studying a little often is better than studying a lot once.