

1. a) $f(x) = \frac{1}{x}$ $g(x) = -x$ b) $f(x) = \frac{1}{x+2}$ $g(x) = 3-x$

$$\begin{aligned} f(g(x)) &= f(-x) \\ &= \frac{1}{(-x)} \\ &= -\frac{1}{x} \end{aligned}$$

$$x \neq 0$$

$$\begin{aligned} f(g(x)) &= f(3-x) \\ &= \frac{1}{(3-x)+2} \\ &= \frac{1}{5-x} \end{aligned}$$

$$x \neq 5$$

c) $f(x) = \frac{x}{x-2}$ $g(x) = 2x$

$$\begin{aligned} f(g(x)) &= f(2x) \\ &= \frac{2x}{2x-2} = \frac{x}{x-1} \quad x \neq 1 \end{aligned}$$

2. a) $f(x) = \sqrt{x}$ $g(x) = 3x$

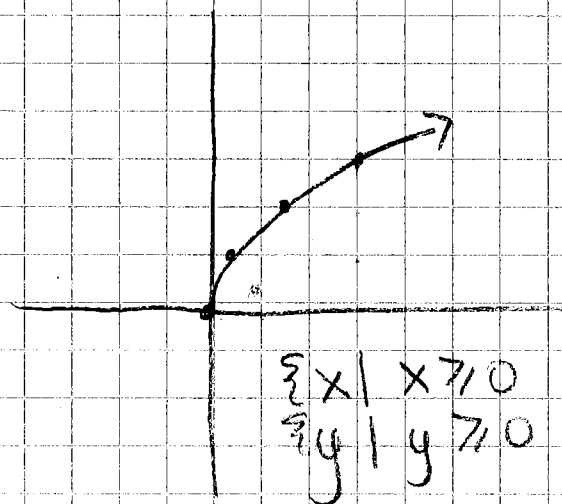
$$\begin{aligned} f(g(x)) &= f(3x) \\ &= \sqrt{3x} \end{aligned}$$

$$y = \sqrt{x}$$

| | |
|---|---|
| 0 | 0 |
| 1 | 1 |
| 4 | 2 |
| 9 | 3 |

$$y = \sqrt{3x}$$

| | |
|---------------|---|
| 0 | 0 |
| $\frac{1}{3}$ | 1 |
| $\frac{4}{3}$ | 2 |
| 3 | 3 |



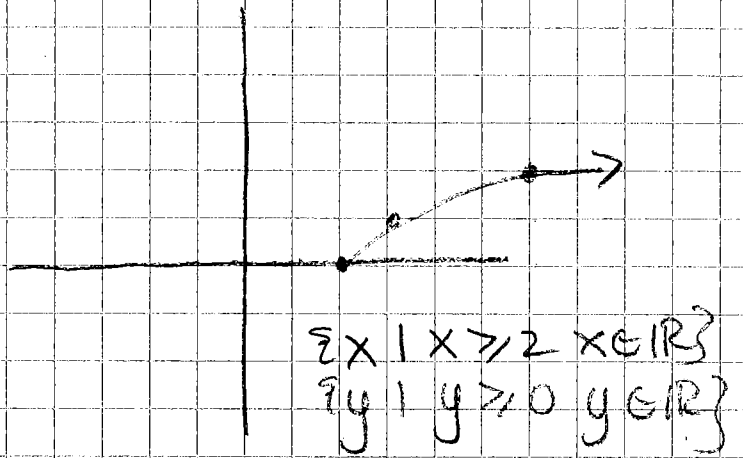
$$\begin{aligned} \{x \mid x \geq 0, x \in \mathbb{R}\} \\ \{y \mid y \geq 0, y \in \mathbb{R}\} \end{aligned}$$

b) $f(x) = \sqrt{x}$ $g(x) = x-2$

$f(g(x)) = f(x-2)$
 $= \sqrt{(x-2)}$

$y = \sqrt{x}$

| | |
|---|---|
| 0 | 0 |
| 1 | 1 |
| 4 | 2 |



c) $f(x) = 2\sqrt{x} + 1$ $g(x) = x-2$

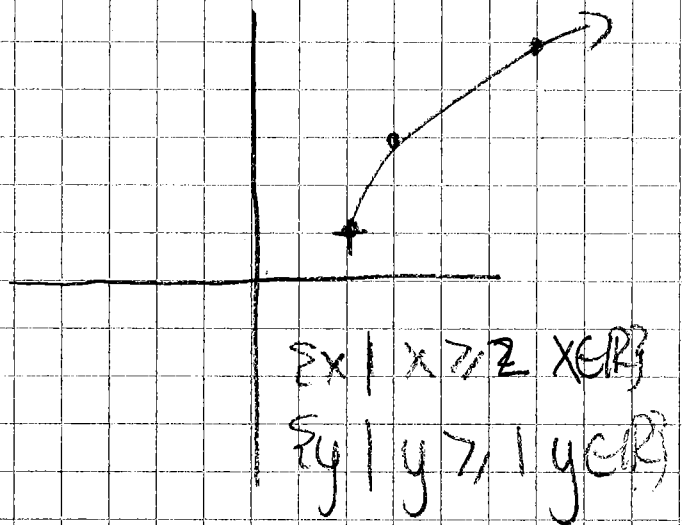
$f(g(x)) = f(x-2)$
 $= 2\sqrt{x-2} + 1$

$y = \sqrt{x}$

| | |
|---|---|
| 0 | 0 |
| 1 | 1 |
| 4 | 2 |
| 9 | 3 |

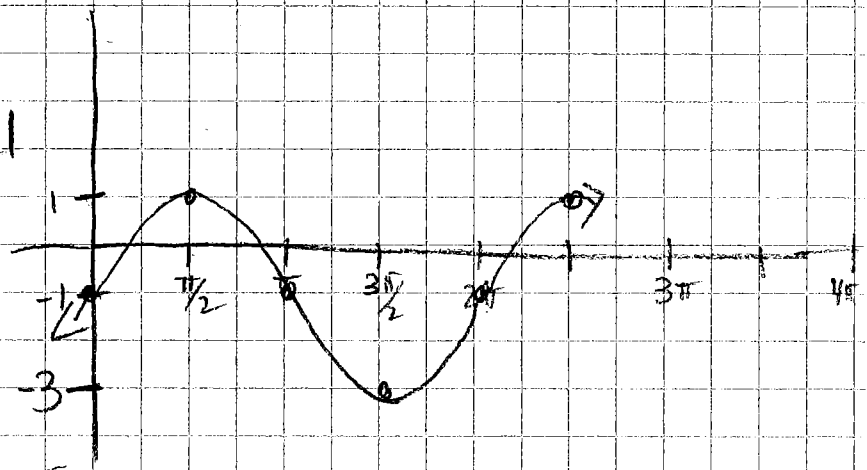
$y = 2\sqrt{x}$

| | |
|---|---|
| 0 | 0 |
| 1 | 2 |
| 4 | 4 |
| 9 | 6 |



3. d) $f(x) = 2x-1$ $g(x) = \sin x$

$f(g(x)) = f(\sin x)$
 $= 2\sin x - 1$

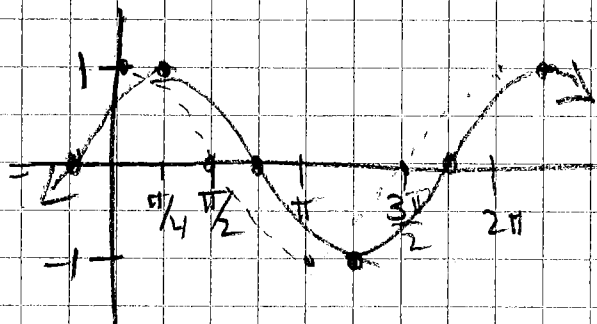


$\{x \mid x \in \mathbb{R}\}$

$\{y \mid -3 \leq y \leq 1, y \in \mathbb{R}\}$

b) $f(x) = \cos x$ $g(x) = x - \frac{\pi}{4}$

$f(g(x)) = f(x - \frac{\pi}{4})$
 $= \cos(x - \frac{\pi}{4})$



$\{x \mid x \in \mathbb{R}\}$

$\{y \mid -1 \leq y \leq 1, y \in \mathbb{R}\}$

c) $f(x) = 3x - 1$ $g(x) = 2^x$

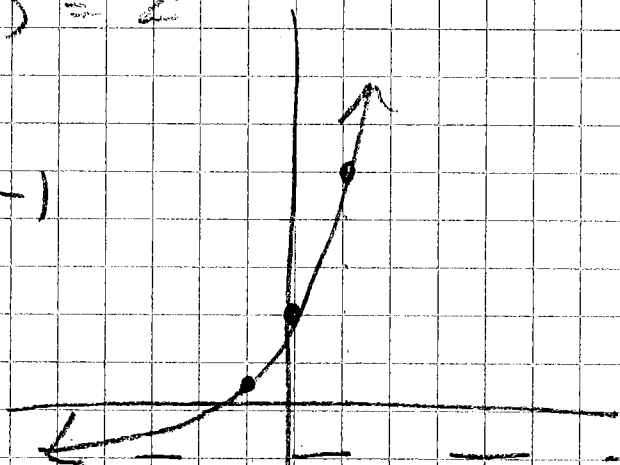
$f(g(x)) = f(2^x)$
 $= 3(2^x) - 1$

$y = 2^x$

| | |
|----|-----|
| -1 | 1/2 |
| 0 | 1 |
| 1 | 2 |
| 2 | 4 |

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

| | |
|----|-----|
| -1 | 3/2 |
| 0 | 3 |
| 1 | 6 |
| 2 | 12 |



$\{x \mid x \in \mathbb{R}\}$

$\{y \mid y > 1, y \in \mathbb{R}\}$

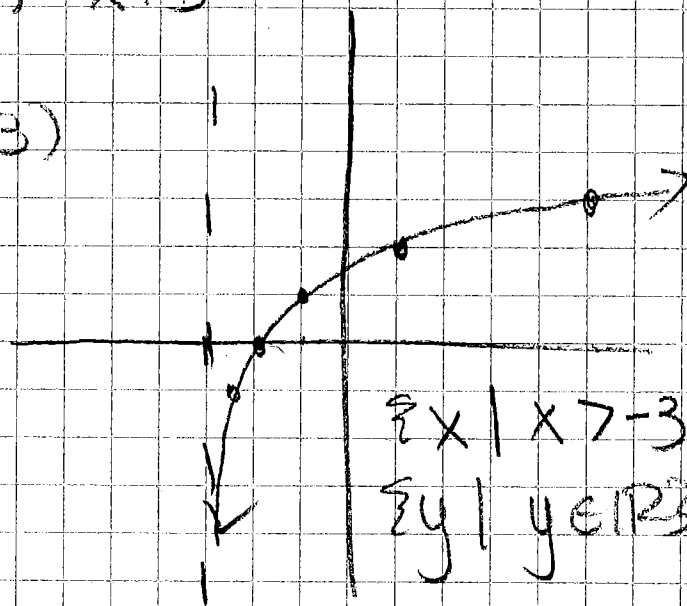
d)

$f(x) = \log_2 x$ $g(x) = x + 3$

$f(g(x)) = f(x + 3)$
 $= \log_2(x + 3)$

$y = \log_2 x$

| | |
|-----|----|
| 1/2 | -1 |
| 1 | 0 |
| 2 | 1 |
| 4 | 2 |
| 8 | 3 |



$\{x \mid x > -3, x \in \mathbb{R}\}$

$\{y \mid y \in \mathbb{R}\}$