#1.

By Pythagorean theorem, $\left(\frac{a}{2}\right)^2 + h^2 = a^2$.

$$\Leftrightarrow \quad h^2 = a^2 - \frac{a^2}{4} = \frac{3}{4}a^2.$$

$$h = \sqrt{\frac{3}{4}a^2} = \frac{\sqrt{3}}{2}a.$$

$$\text{Area} = \frac{1}{2} \cdot a \cdot h = \frac{1}{2} a \cdot \frac{\sqrt{3}}{2} a = \underline{\underline{\frac{\sqrt{3}}{4} a^2}}.$$

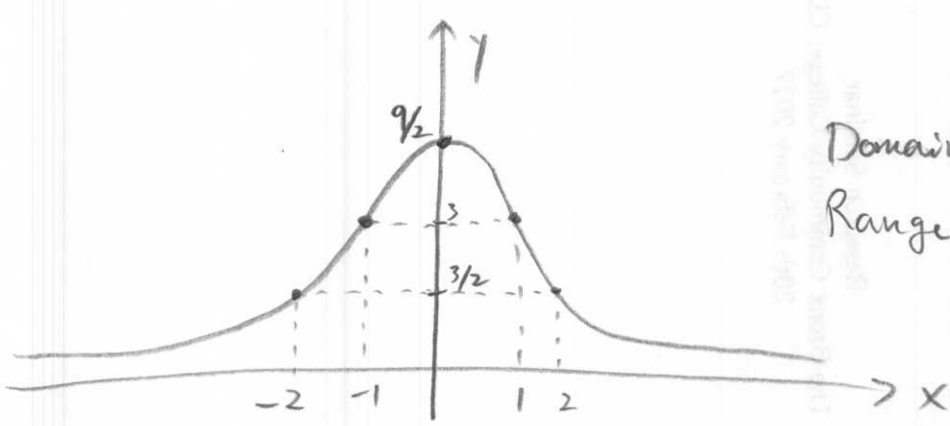
#2.

$$\frac{f(x+h) - f(x)}{h} = \frac{2(x+h)^2 - 2x^2}{h} = \frac{2(x^2 + 2xh + h^2) - 2x^2}{h}$$

$$= \frac{\cancel{2x^2} + 4xh + 2h^2 - \cancel{2x^2}}{h}$$

$$= \underline{\underline{4x + 2h}}.$$

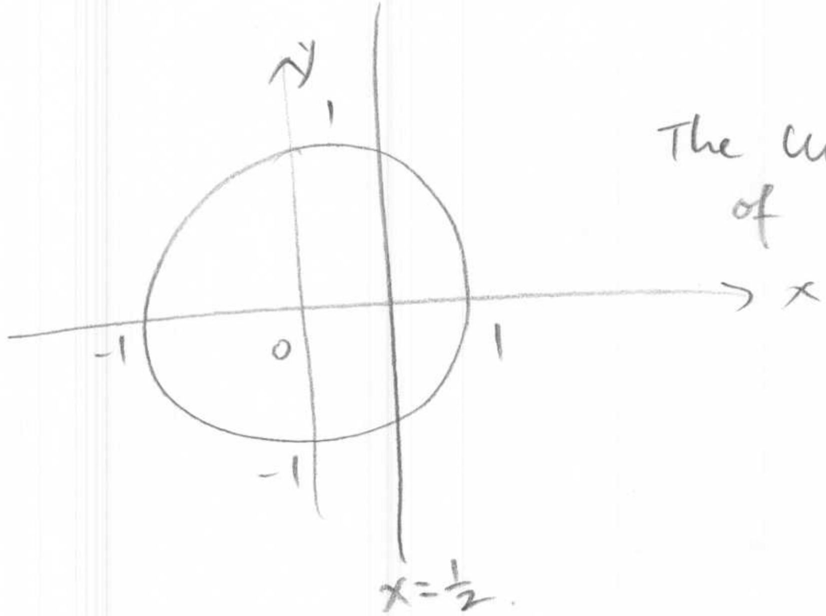
#3



Domain: all real numbers

Range: $\{y : 0 < y \le \frac{9}{2}\}$

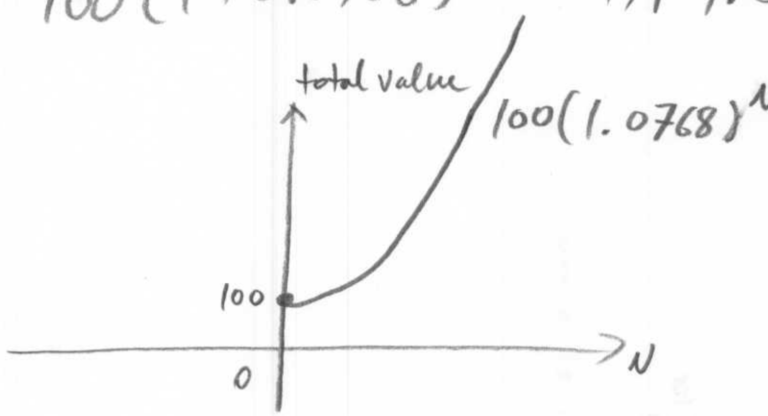
#4.



The unit circle is not a graph of function because the vertical line test with $x = \frac{1}{2}$ fails.

#5. (1) $100(1+0.0768)^{40} = 1{,}929.31$

(2)



#6

$\log(2x+5) + \log 3 = \log(3x+5)$

$2x+5 > 0 \iff x \geq -\frac{5}{2}$

$3x+5 > 0 \iff x \geq -\frac{5}{3}$

$\iff \log 3(2x+5) = \log(3x+5)$

$\iff 3\cdot(2x+5) = 3x+5$

$\iff 6x+15 = 3x+5$

$\iff 3x = -10$

$x = -\frac{10}{3} < -3$ where $x \geq -2.5 = -\frac{5}{2}$ is the requirement

Answer: There is no x satisfying the given equation

#7. $3^{2x-2} = 9^{4x+1}$

$\Leftrightarrow 3^{2x-2} = 3^{8x+2}$

$\Leftrightarrow \log_3 3^{2x-2} = \log_3 3^{8x+2}$

Take $\log_3$ on both sides

$\Leftrightarrow 2x-2 = 8x+2$

$\Leftrightarrow 6x = -4$

$\Leftrightarrow x = -\frac{2}{3}$ //

#8.

$\log_{\frac{1}{25}} 125 = \log_{\frac{1}{5^2}} 5^3 = \log_{5^{-2}} 5^3$

$= 3 \log_{5^{-2}} 5 = 3 \log_{5^{-2}} (5^{-2})^{-\frac{1}{2}}$

$= 3 \cdot \left(-\frac{1}{2}\right) \underbrace{\boxed{\log_{5^{-2}} 5^{-2}}}_{= 1} = -\frac{3}{2}$ //

#9. $\log_7 \frac{x^2 y^{-3}}{\sqrt[3]{49}} = \log_7 x^2 + \log_7 y^{-3} - \log_7 \sqrt[3]{49}$

$= 2\log_7 x - 3\log_7 y - \log_7 7^{\frac{2}{3}}$

$= 2\log_7 x - 3\log_7 y - \frac{2}{3}\boxed{\log_7 7}$ $= 1$

$= 2\log_7 x - 3\log_7 y - \frac{2}{3}$ //

#10. $y = 1000^x$

$\Leftrightarrow \log y = x \log 1000 = 3x$