Question 1 Bridget Gail Mtsengi

$f(x) = 3\log_3 x + \log x$

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

$h(x) = 12x^2 - 7x$

$r(x) = 4^{2x+1} - 8$

$t(x) = \sqrt{x}$

1.1 $D_f = \{x \in \mathbb{R} : x > 0\}$

$f(x) = -\log_3 \frac{1}{4}$

$3\log_3 x + \log_{\frac{1}{3}} x = -\log_3 \frac{1}{4}$

$\log_3 x^3 - \log_3 x = \log_3 \left(\frac{1}{4}\right)^{-1}$

$\log_3 \left(\frac{x^3}{x}\right) = \log_3 4$

$\frac{x^3}{x} = 4$

$x^2 = 4$

$x^2 - 4 = 0$

$(x+2)(x-2) = 0$

$x = -2$ or $x = 2$

Invalid

$x = 2$

1.2 $D_g = \{x \in \mathbb{R}\}$

$g(x) = 0$

$$\sqrt{(x-2)^2} - \frac{x}{2} = 0$$

$$\sqrt{(x-2)^2} = \frac{x}{2}$$

$$\left(\sqrt{(x-2)^2}\right)^2 = \left(\frac{x}{2}\right)^2$$

$$(x-2)^2 = \frac{x^2}{4}$$

$$(x-2)^2 - \frac{x^2}{4} = 0$$

$$\left[(x-2) + \frac{x}{2}\right]\left[(x-2) - \frac{x}{2}\right] = 0$$

$$\left[\frac{3}{2}x - 2\right]\left[\frac{1}{2}x - 2\right] = 0$$

$$\frac{3}{2}x - 2 = 0 \quad \text{or} \quad \frac{1}{2}x - 2 = 0$$

$$3x - 4 = 0 \quad \text{or} \quad x - 4 = 0$$

$$x = \frac{4}{3} \quad \text{or} \quad x = 4$$

1.3 $D_h = \{x \in \mathbb{R}\}$

$10 \geq h(x)$

$10 \geq 12x^2 - 7x$

$-12x + 7x + 10 \geq 0$

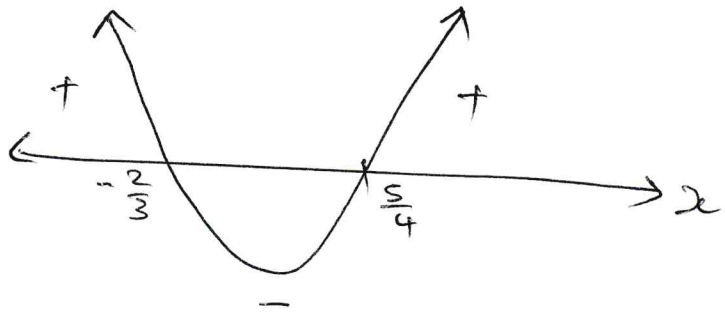
$12x^2 - 7x - 10 \leq 0$

$12x^2 + 8x - 15x - 10 \leq 0$

$4x(3x+2) - 5(3x+2) \leq 0$

$(3x+2)(4x-5) \leq 0$

$x = -\frac{2}{3}$ or $x = \frac{5}{4}$



$-\frac{2}{3} \leq x \leq \frac{5}{4}$

$x \in [-\frac{2}{3}; \frac{5}{4}]$

1.4 $D_r = \{x \in \mathbb{R}\}$

$r(x) = 0$

$4^{2x+1} - 8 = 0$

$4^{2x+1} = 8$

$(2^2)^{2x+1} = 2^3$

$2^{4x+2} = 2^3$

$4x + 2 = 3$

$4x = 1$

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

1.5 $D_{h.i} = \{x \in \mathbb{R} : x \geq 0\}$

1.6 $D_{\frac{f}{g}} = \{x \in \mathbb{R} : x > 0 \neq g \neq 0\}$

$g \neq 0$

$\sqrt{(x-2)^2} - \frac{x}{2} \neq 0$ therefore $x \neq \frac{4}{3}$; $x \neq 4$

$D_{f/g} = \{x \in \mathbb{R} : x > 0, x \neq \frac{4}{3}, x \neq 4\}$

Question 2

$y = \frac{4}{9x} \Rightarrow$ hyperbola

Ons

2.1 $P\left(\sqrt{\frac{4}{9}} ; \sqrt{\frac{4}{9}}\right)$

$P\left(\frac{2}{3} ; \frac{2}{3}\right)$

$Q = \left(-\frac{2}{3} ; -\frac{2}{3}\right)$

2.2 $S\left(0 ; \frac{2}{3}\right)$

$R\left(\frac{2}{3} ; 0\right)$

2.3 $(x-a)^2 + (y-b)^2 = r^2$

$r = d(S;P)$

$r = \frac{2}{3}$

$r^2 = \frac{4}{9}$

$(a;b) = P\left(\frac{2}{3} ; \frac{2}{3}\right)$

$\left(x - \frac{2}{3}\right)^2 + \left(y - \frac{2}{3}\right)^2 = \frac{4}{9}$

2.4 $y = mx + c$

y-int is $S\left(0 ; \frac{2}{3}\right)$

$y = mx + \frac{2}{3}$

other point $R\left(\frac{2}{3} ; 0\right)$