① $x^2 - 18x + 79 = 0 \qquad x^2 - 18x + \underline{81} = -79 + \underline{81} \qquad (x-9)^2 = 2 \qquad x - 9 = \pm\sqrt{2}$

$\boxed{x = 9 \pm \sqrt{2}}$

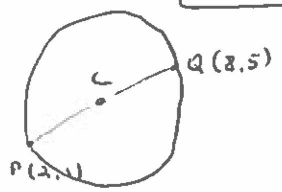
② A) $|5 - 2x| < 13 \qquad -13 < 5 - 2x < 13 \qquad -18 < -2x < 8$

$9 > x > -4$ OR $-4 < x < 9$ SOL. : $\boxed{(-4, 9)}$

B) $\dfrac{x^2 - x - 20}{9 - x^2} \geq 0 \qquad \dfrac{(x-5)(x+4)}{(3-x)(3+x)} \geq 0$

IF $x = 0$, $y = -\frac{20}{9}$

SOL. : $\boxed{[-4, -3) \cup (3, 5]}$

③ 

$C = M = \left(\frac{2+8}{2}, \frac{1+5}{2}\right) = \underline{(5, 3)}$

$r = d(C, Q) = \sqrt{(8-5)^2 + (5-3)^2} = \sqrt{3^2 + 2^2} = \underline{\sqrt{13}}$

$\boxed{(x-5)^2 + (y-3)^2 = 13}$ IS THE EQUATION OF THE CIRCLE.

④ $f(x) = 3x^2 - 5x - 6$

$$\frac{f(x+h) - f(x)}{h} = \frac{\left[3(x+h)^2 - 5(x+h) - 6\right] - \left[3x^2 - 5x - 6\right]}{h}$$

$$= \frac{3(x^2 + 2xh + h^2) - 5x - 5h - 6 - 3x^2 + 5x + 6}{h}$$

$$= \frac{\cancel{3x^2} + 6xh + 3h^2 \cancel{-5x} - 5h \cancel{-6} \cancel{-3x^2} \cancel{+5x} \cancel{+6}}{h}$$

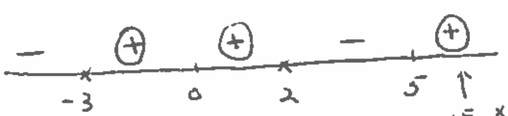
$$= \frac{6xh + 3h^2 - 5h}{h} = \frac{\cancel{h}(6x + 3h - 5)}{\cancel{h}} = \boxed{6x + 3h - 5}$$

⑤ A) $f(x) = \dfrac{x^2 - 9x}{x^2 - x - 12} = \dfrac{x^2 - 9x}{(x-4)(x+3)}$ IS DEFINED WHERE $x \neq 4$ AND $x \neq -3$:

DOMAIN : $\boxed{(-\infty, -3) \cup (-3, 4) \cup (4, \infty)}$

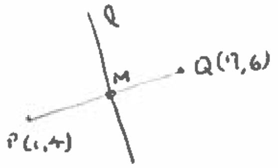
B) $f(x) = \sqrt{\dfrac{x^3 - 5x^2}{x^2 + x - 6}}$

f IS DEFINED WHERE $\dfrac{x^3 - 5x^2}{x^2 + x - 6} \geq 0$, SO $\dfrac{x^2(x-5)}{(x+3)(x-2)} \geq 0$:



IF $x = 6$, $\dfrac{x^2(x-5)}{(x+3)(x-2)} = \dfrac{36 \cdot 1}{9 \cdot 4}$

DOMAIN : $\boxed{(-3, 2) \cup [5, \infty)}$ (OR $(-3, 0] \cup [0, 2) \cup [5, \infty)$)

⑥ 

$m_{PQ} = \frac{6-4}{7-1} = \frac{2}{6} = \frac{1}{3}$, so ℓ has slope $m = -\frac{1}{1/3} = -3$.

ℓ passes through $M = \left(\frac{1+7}{2}, \frac{4+6}{2}\right) = (4,5)$, so

it has equation $y-5 = -3(x-4)$ or $\boxed{y = -3x+17}$.

⑦ $f(x) = \frac{5}{x^2}$

$$\frac{f(t)-f(x)}{t-x} = \frac{\frac{5}{t^2} - \frac{5}{x^2}}{t-x} \cdot \frac{t^2x^2}{t^2x^2} = \frac{5x^2 - 5t^2}{(t-x)(t^2x^2)} = \frac{-5(t^2-x^2)}{(t-x)(t^2x^2)}$$

$$= \frac{-5\cancel{(t-x)}(t+x)}{\cancel{(t-x)}(t^2x^2)} = \boxed{\frac{-5(t+x)}{t^2x^2}}$$

⑧ $2(3x+2)(3)(4x+1)^{1/2} + (3x+2)^2(2)(4x+1)^{-1/2}$

$= 2(3x+2)(4x+1)^{-1/2}\left[3(4x+1)^1 + (3x+2)\right]$

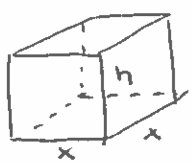
$= 2(3x+2)(4x+1)^{-1/2}\left[12x+3+3x+2\right] = \frac{2(3x+2)(15x+5)}{(4x+1)^{1/2}}$

$= \frac{2(3x+2)\cdot 5(3x+1)}{(4x+1)^{1/2}} = \boxed{\frac{10(3x+2)(3x+1)}{(4x+1)^{1/2}}}$

⑨ A) $y=\sqrt{x} \longrightarrow y = -\sqrt{x} \longrightarrow y = -\sqrt{x}+3 \longrightarrow \boxed{y = -\sqrt{\frac{x}{4}}+3}$

B) $y=\sqrt{x} \longrightarrow y = \sqrt{x-6} \longrightarrow \boxed{y = \sqrt{-x-6}}$

C) $y=\sqrt{x} \longrightarrow x = \sqrt{y} \longrightarrow x = \sqrt{y-4} \longrightarrow \boxed{x+8 = \sqrt{y-4}}$ or $\boxed{x = \sqrt{y-4} - 8}$

⑩ 

1) $S = 2x^2 + 4xh$

2) $V = lwh = x^2h = 20$, so $h = \frac{20}{x^2}$

3) $\boxed{S} = 2x^2 + 4x\left(\frac{20}{x^2}\right) \boxed{= 2x^2 + \frac{80}{x}}$

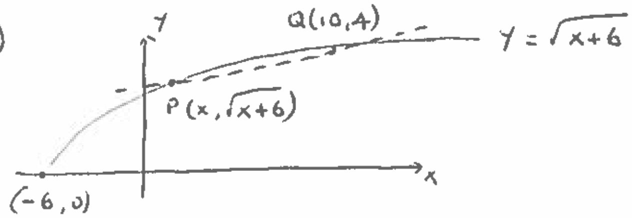
⑪ VERTEX: $(2,-6)$, PASSES THROUGH $(5,30)$

$y = a(x-2)^2 - 6$ so $x=5$, $y=30$ gives $30 = a(5-2)^2 - 6$,

$30 = 9a - 6$, $9a = 36$, $a = 4$ so

$f(x) = 4(x-2)^2 - 6 = 4(x^2-4x+4) - 6 = \boxed{4x^2 - 16x + 10}$

(12)



$$m = \frac{\sqrt{x+6}-4}{x-10} \cdot \frac{\sqrt{x+6}+4}{\sqrt{x+6}+4} = \frac{x+6-16}{(x-10)(\sqrt{x+6}+4)} = \frac{\cancel{x-10}}{\cancel{(x-10)}(\sqrt{x+6}+4)}$$

$$= \frac{1}{\sqrt{x+6}+4} = \frac{3}{19},$$

so $\sqrt{x+6}+4 = \frac{19}{3}$, $\sqrt{x+6} = \frac{19}{3} - 4 = \frac{7}{3}$,

$x+6 = \frac{49}{9}$, $x = \frac{49}{9} - 6 = -\frac{5}{9}$ so $P = \boxed{\left(-\frac{5}{9}, \frac{7}{3}\right)}$

$\boxed{\text{or}}$ $m = \frac{\sqrt{x+6}-4}{x-10} = \frac{3}{19}$, $19(\sqrt{x+6}-4) = 3(x-10)$,

$19\sqrt{x+6} - 76 = 3x - 30$, $19\sqrt{x+6} = 3x + 46$,

$361(x+6) = 9x^2 + 276x + 2116$,

$361x + 2166 = 9x^2 + 276x + 2116$,

$0 = 9x^2 - 85x - 50$

$(9x+5)(x-10) = 0$

$9x+5=0$ or $x-10=0$

$\boxed{x = -\frac{5}{9}}$ $\cancel{x=10}$

$\boxed{y} = \sqrt{x+6} = \sqrt{-\frac{5}{9}+\frac{54}{9}} = \sqrt{\frac{49}{9}} = \boxed{\frac{7}{3}}$