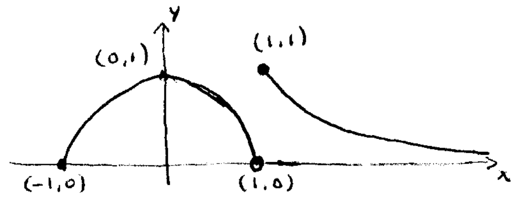
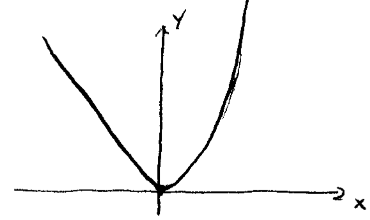
**3.2 – 24**

$$B(x) = \begin{cases} \sqrt{1-x^2}, & \text{if } -1 \le x < 1 \\ 1/x, & \text{if } x \ge 1 \end{cases}$$




**26**

$$y = \begin{cases} |x|, & \text{if } x \le 0 \\ x^2, & \text{if } x > 0 \end{cases}$$



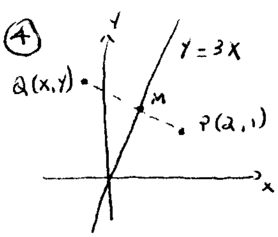

**W.S. – 2**

A) $2x^2 - 6x + 3 = 0$ $\quad x^2 - 3x + \frac{3}{2} = 0$ $\quad x^2 - 3x + \frac{9}{4} = -\frac{3}{2} + \frac{9}{4}$

$(x - \frac{3}{2})^2 = \frac{3}{4}$ $\quad x - \frac{3}{2} = \pm \frac{\sqrt{3}}{2}$ $\quad x = \frac{3}{2} \pm \frac{\sqrt{3}}{2} = \boxed{\frac{3 \pm \sqrt{3}}{2}}$

B) $2x^2 - 6x + 3 = 0$ $\quad x = \dfrac{-(-6) \pm \sqrt{(-6)^2 - 4(2)(3)}}{2(2)} = \dfrac{6 \pm \sqrt{12}}{4} = \dfrac{6 \pm 2\sqrt{3}}{4} = \boxed{\dfrac{3 \pm \sqrt{3}}{2}}$

**4**




1) The line through P and Q has equation

$y - 1 = -\frac{1}{3}(x - 2)$, so $y - 1 = -\frac{1}{3}x + \frac{2}{3}$ or $y = -\frac{1}{3}x + \frac{5}{3}$

2) The lines intersect where $3x = -\frac{1}{3}x + \frac{5}{3}$, so

$\frac{10}{3}x = \frac{5}{3}$, $\quad x = \frac{1}{2}$ and $y = \frac{3}{2}$. $\longleftarrow$ (since $y = 3x$)

3) $M = \left(\frac{x+2}{2}, \frac{y+1}{2}\right) = \left(\frac{1}{2}, \frac{3}{2}\right)$, so $\frac{x+2}{2} = \frac{1}{2}$ and $\frac{y+1}{2} = \frac{3}{2}$

Gives $x + 2 = 1$ and $y + 1 = 3$, $\quad x = -1$ and $y = 2$, so $Q = \boxed{(-1, 2)}$

**6** $f(x) = \dfrac{4}{x^2}$

A) $$\frac{f(x) - f(a)}{x - a} = \frac{\frac{4}{x^2} - \frac{4}{a^2}}{x - a} \cdot \frac{x^2 a^2}{x^2 a^2} = \frac{4a^2 - 4x^2}{(x-a)(x^2 a^2)} = \frac{-4(x^2 - a^2)}{(x-a)(x^2 a^2)}$$

$$= \frac{-4\cancel{(x-a)}(x+a)}{\cancel{(x-a)}(x^2 a^2)} = \boxed{-\frac{4(x+a)}{x^2 a^2}}$$

B) $$\frac{f(x+h) - f(x)}{h} = \frac{\frac{4}{(x+h)^2} - \frac{4}{x^2}}{h} \cdot \frac{(x+h)^2 x^2}{(x+h)^2 x^2} = \frac{4x^2 - 4(x+h)^2}{h(x+h)^2 x^2}$$

$$= \frac{4x^2 - 4(x^2 + 2xh + h^2)}{h(x+h)^2 x^2} = \frac{\cancel{4x^2} - \cancel{4x^2} - 8xh - 4h^2}{h(x+h)^2 x^2}$$

$$= \frac{-8xh - 4h^2}{h(x+h)^2 x^2} = \frac{-4\cancel{h}(2x+h)}{\cancel{h}(x+h)^2 x^2} = \boxed{-\frac{4(2x+h)}{(x+h)^2 x^2}}$$

⑧ $f(x) = \dfrac{2x+1}{x-4}$

A) $$\frac{f(x)-f(a)}{x-a} = \frac{\dfrac{2x+1}{x-4} - \dfrac{2a+1}{a-4}}{x-a} \cdot \frac{(x-4)(a-4)}{(x-4)(a-4)} = \frac{(2x+1)(a-4)-(x-4)(2a+1)}{(x-a)(x-4)(a-4)}$$

$$= \frac{\cancel{2ax} + a - 8x - \cancel{4} - (\cancel{2ax} - 8a + x - \cancel{4})}{(x-a)(x-4)(a-4)} = \frac{9a-9x}{(x-a)(x-4)(a-4)}$$

$$= \frac{-9\cancel{(x-a)}}{\cancel{(x-a)}(x-4)(a-4)} = \boxed{\frac{-9}{(x-4)(a-4)}}$$

B) $$\frac{f(x+h)-f(x)}{h} = \frac{\dfrac{2(x+h)+1}{(x+h)-4} - \dfrac{2x+1}{x-4}}{h} \cdot \frac{(x+h-4)(x-4)}{(x+h-4)(x-4)}$$

$$= \frac{(2x+2h+1)(x-4)-(2x+1)(x+h-4)}{h(x+h-4)(x-4)}$$

$$= \frac{\cancel{2x^2} + \cancel{2hx} + \cancel{x} - \cancel{8x} - 8h - \cancel{4} - (\cancel{2x^2} + \cancel{2hx} - \cancel{8x} + \cancel{x} + h - \cancel{4})}{h(x+h-4)(x-4)}$$

$$= \frac{-9\cancel{h}}{\cancel{h}(x+h-4)(x-4)} = \boxed{\frac{-9}{(x+h-4)(x-4)}}$$

⑨ $f(x) = \sqrt{2x+5}$

A) $$\frac{f(x)-f(a)}{x-a} = \frac{\sqrt{2x+5}-\sqrt{2a+5}}{x-a} \cdot \frac{\sqrt{2x+5}+\sqrt{2a+5}}{\sqrt{2x+5}+\sqrt{2a+5}} = \frac{(2x+\cancel{5})-(2a+\cancel{5})}{(x-a)(\sqrt{2x+5}+\sqrt{2a+5})}$$

$$= \frac{2\cancel{(x-a)}}{\cancel{(x-a)}(\sqrt{2x+5}+\sqrt{2a+5})} = \boxed{\frac{2}{\sqrt{2x+5}+\sqrt{2a+5}}}$$

B) $$\frac{f(x+h)-f(x)}{h} = \frac{\sqrt{2(x+h)+5}-\sqrt{2x+5}}{h} \cdot \frac{\sqrt{2(x+h)+5}+\sqrt{2x+5}}{\sqrt{2(x+h)+5}+\sqrt{2x+5}}$$

$$= \frac{(2(x+h)+5)-(2x+5)}{h(\sqrt{2x+2h+5}+\sqrt{2x+5})} = \frac{\cancel{2x}+2h+\cancel{5}-\cancel{2x}-\cancel{5}}{h(\sqrt{2x+2h+5}+\sqrt{2x+5})}$$

$$= \frac{2\cancel{h}}{\cancel{h}(\sqrt{2x+2h+5}+\sqrt{2x+5})} = \boxed{\frac{2}{\sqrt{2x+2h+5}+\sqrt{2x+5}}}$$

⑩ $|x^2-17| \geq 8$

| | | | |
|---|---|---|---|
| IFF | $x^2 - 17 \leq -8$ | OR | $x^2 - 17 \geq 8$ |
| IFF | $x^2 \leq 9$ | OR | $x^2 \geq 25$ |
| IFF | $\sqrt{x^2} \leq \sqrt{9}$ | OR | $\sqrt{x^2} \geq \sqrt{25}$ |
| IFF | $\lvert x \rvert \leq 3$ | OR | $\lvert x \rvert \geq 5$ |
| IFF | $-3 \leq x \leq 3$ | OR | $x \leq -5$ OR $x \geq 5$ |

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

(OR REWRITE $x^2 \leq 9$ AS $x^2 - 9 \leq 0$ OR $(x-3)(x+3) \leq 0$
AND $x^2 \geq 25$ AS $x^2 - 25 \geq 0$ OR $(x-5)(x+5) \geq 0$)