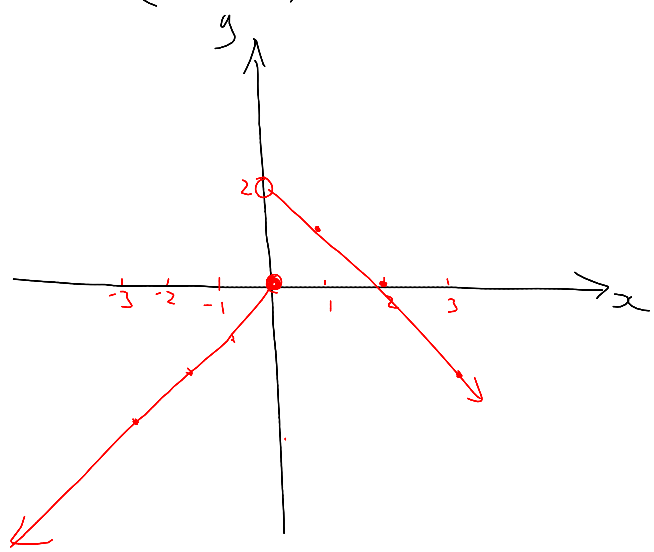
5a) $f(x) = \begin{cases} x, & x \le 0 \\ 2-x, & x > 0 \end{cases}$



8d) $f(x) = x^3 - x + 1$

$$\frac{f(h) - f(-h)}{2h} = \frac{h^3 - h + 1 - (-h^3 + h + 1)}{2h}$$

$$= \frac{h^3 - h + 1 + h^3 - h - 1}{2h}$$

$$= \frac{2h^3 - 2h}{2h}$$

$$= \underline{h^2 - 1}$$

8f) $f(x) = x^3 - x + 1$

$$\frac{1}{6}\left(f(0) + 4f\left(\frac{1}{2}\right) + f(1)\right)$$

$$= \frac{1}{6}\left(0^3 - 0 + 1 + 4\left(\left(\frac{1}{2}\right)^3 - \frac{1}{2} + 1\right) + 1^3 - 1 + 1\right)$$

$$= \frac{1}{6}\left(1 + 4\left(\frac{1}{8} - \frac{1}{2} + 1\right) + 1\right)$$

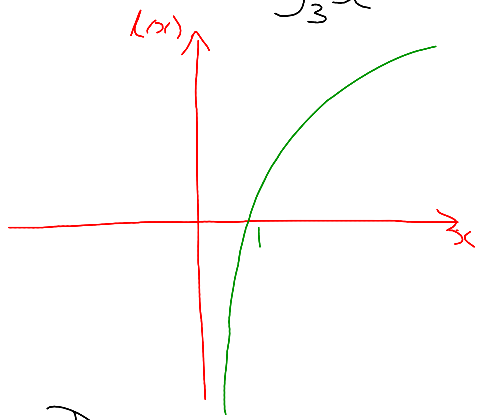
$$= \frac{1}{6}\left(2 + 4\left(\frac{5}{8}\right)\right)$$

$$= \frac{1}{6}\left(2 + \frac{5}{2}\right)$$

$$= \frac{1}{{}_{2}\cancel{6}} \times \frac{\cancel{9}^{3}}{2}$$

$$= \underline{\underline{\frac{3}{4}}}$$

10 c) $f(x) = \log_3 x$



$\underline{\underline{D}}$: $x > 0$

12b)
$$g(x) = \frac{x}{x^2+1}$$

$$g\left(\frac{1}{x}\right) = \frac{\frac{1}{x}}{\left(\frac{1}{x}\right)^2 + 1}$$

$$= \frac{\frac{x^2}{x}}{\frac{x^2}{x^2} + 1 \times x^2}$$

$$= \frac{x}{1 + x^2}$$

$$= g(x)$$

12 d)

$$f(x) = x + \frac{1}{x}$$

$$f(x) \times f\left(x + \frac{1}{x}\right)$$

$$= \left(x + \frac{1}{x}\right)\left(x + \frac{1}{x} + \frac{1}{x + \frac{1}{x}}\right)$$

$$= \frac{x^2+1}{x}\left(\frac{x^2+1}{x} + \frac{x}{x^2+1}\right)$$

$$= \frac{x^2+1}{x} \times \frac{(x^2+1)^2 + x^2}{x(x^2+1)}$$

$$= \frac{\cancel{x^2+1}}{x} \times \frac{x^4 + 3x^2 + 1}{x\cancel{(x^2+1)}}$$

$$= \frac{x^4 + 3x^2 + 1}{x^2}$$

$$f(x^2) + 3$$

$$= x^2 + \frac{1}{x^2} + 3$$

$$= \frac{x^4 + 1 + 3x^2}{x^2}$$

$$\therefore \underline{f(x) \times f\left(x + \frac{1}{x}\right) = f(x^2) + 3}$$

14

$$e(x) = \left(1 + \frac{1}{x}\right)^x$$

$$e = \lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n$$

$$e(1) = \left(1 + \frac{1}{1}\right)^1 = 2$$

$$e(10) = \left(1 + \frac{1}{10}\right)^{10} = 2.59$$

$$e(100) = \left(1 + \frac{1}{100}\right)^{100} = 2.70$$

$$e(1000) = \left(1 + \frac{1}{1000}\right)^{1000} = 2.72$$

$$e(10000) = \left(1 + \frac{1}{10000}\right)^{10000} = 2.72$$

12d) $f(x) = x + \frac{1}{x}$

$$f(x) \times f\left(x + \frac{1}{x}\right) = \left(x + \frac{1}{x}\right)\left(x + \frac{1}{x} + \frac{1}{x + \frac{1}{x}}\right)$$

$$= \frac{x^2+1}{x} \times \left(x + \frac{1}{x} + \frac{x}{x^2+1}\right)$$

$$= \frac{x^2+1}{x} \times \frac{x^2(x^2+1) + x^2+1 + x^2}{x(x^2+1)}$$

$$= \frac{\cancel{x^2+1}}{x} \times \frac{x^4 + 3x^2 + 1}{x(\cancel{x^2+1})}$$

$$= \frac{x^4 + 3x^2 + 1}{x^2}$$

$$= x^2 + 3 + \frac{1}{x^2}$$

$$= x^2 + \frac{1}{x^2} + 3$$

$$= f(x^2) + 3$$

15

$c(x) = \dfrac{3^x + 3^{-x}}{2}$ $s(x) = \dfrac{3^x - 3^{-x}}{2}$

a) $[c(x)]^2 = \dfrac{3^{2x} + 2 + 3^{-2x}}{4}$ $\dfrac{1}{2}\{c(2x) + 1\} =$

16)

$$\operatorname{ath}(x) = \log_2\left(\frac{1+x}{1-x}\right)$$

$$\operatorname{ath}\left(\frac{2x}{1+x^2}\right) = \log_2\left[\frac{1+\frac{2x}{1+x^2}}{1-\frac{2x}{1+x^2}}\right]$$

$$= \log_2\left(\frac{1+2x+x^2}{1-2x+x^2}\right)$$

$$= \log_2\left(\frac{1+x}{1-x}\right)^2$$

$$= 2\log_2\left(\frac{1+x}{1-x}\right)$$

$$= \underline{2\operatorname{ath}(x)}$$