

1) $y = x^{\frac{1}{x}} \Rightarrow \ln y = \frac{1}{x} \ln x$

$$\lim_{x \rightarrow \infty} \frac{1}{x} \ln x = \lim_{x \rightarrow \infty} \frac{\ln x}{x} = \lim_{x \rightarrow \infty} \frac{\frac{1}{x}}{1} = 0 \quad \checkmark \text{ 5p}$$

$$\lim_{x \rightarrow \infty} x^{\frac{1}{x}} = e^{\lim_{x \rightarrow \infty} \frac{1}{x} \ln x} = e^0 = 1 \quad \checkmark \text{ 5p}$$

2) $f'(x) = \frac{1}{(1-x)^2}$, $f''(x) = \frac{2}{(1-x)^3}$, $f'''(x) = \frac{2 \cdot 3}{(1-x)^4}$, ... $\checkmark \text{ 5p}$

$$f^{(n)}(x) = \frac{n!}{(1-x)^{n+1}} \quad \checkmark \text{ 5p}$$

3) i) $TK = 12 - 1 - 2 \quad \checkmark \text{ 5p}$

ii) $\lim_{x \rightarrow -2^-} \frac{2x}{x+2} = +\infty$, $\lim_{x \rightarrow -2^+} \frac{2x}{x+2} = -\infty$

$x = -2$ doğrusu dikey asim.

$$\lim_{x \rightarrow \pm\infty} \frac{2x}{x+2} = 2 \Rightarrow y = 2 \text{ doğrusu yatay asim.}$$

iii) $x = 0$ için $y = 0 \quad \checkmark \text{ 5p}$

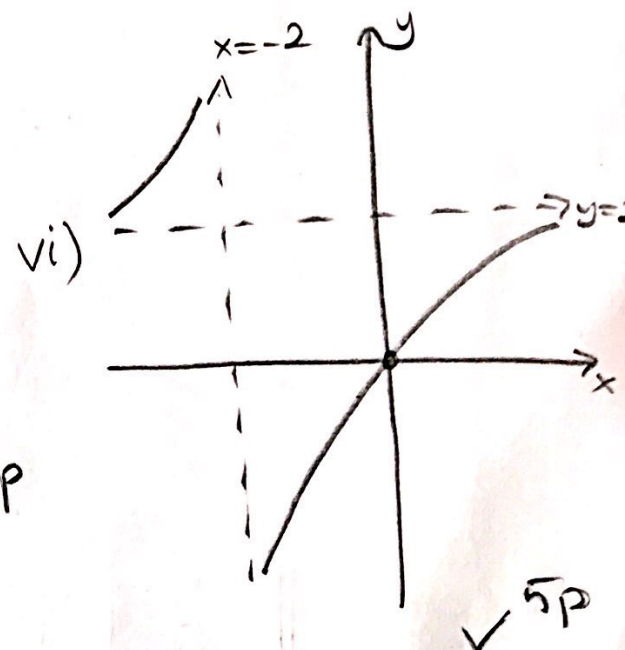
iv) $f'(x) = \frac{2(x+2) - 2x}{(x+2)^2} = \frac{4}{(x+2)^2}$

$x = -2$ de f' mevcut değil.

v)

x	$-\infty$	-2	0	$+\infty$
f'		+	+	+
f	2	$+\infty$	$-\infty$	0

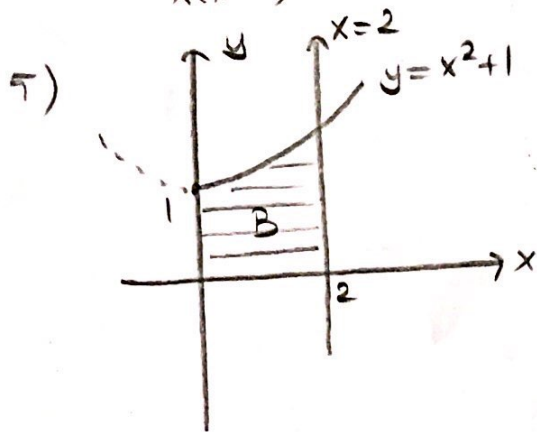
$\checkmark \text{ 5p}$



$$4) A) \int (1 - \sin x + \frac{2}{1+x^2} + x^2) dx = x + \cos x + 2 \arctan x + \frac{x^3}{3} + C \quad \checkmark 10p$$

$$B) \frac{1-x}{x(x+1)} = \frac{A}{x} + \frac{B}{x+1}, \quad \begin{cases} Ax + A + Bx = 1 - x \\ A + B = -1 \\ A = 1 \end{cases} \Rightarrow B = -2 \quad \checkmark 5p$$

$$\int \frac{1-x}{x(x+1)} dx = \int \frac{dx}{x} - 2 \int \frac{dx}{x+1} = \ln|x| - 2 \ln|x+1| + C \quad \checkmark 5p$$



$$A) A_B = \int_0^2 (x^2+1) dx = \left[\frac{x^3}{3} + x \right]_0^2 = \frac{8}{3} + 2 = \frac{14}{3} \quad \checkmark 5p$$

$$B) V_B = \pi \int_0^2 (x^2+1)^2 dx = \pi \int_0^2 (x^4 + 2x^2 + 1) dx = \pi \left(\frac{x^5}{5} + \frac{2}{3}x^3 + x \right) \Big|_0^2 = \frac{206\pi}{15} \quad \checkmark 5p$$

$$6) c_n = \frac{1}{n3^n}, \quad \lim \sqrt[n]{|c_n|} = \lim \frac{1}{3\sqrt[n]{n}} = \frac{1}{3} \quad \checkmark 5p$$

$$|x-5| < 3 \Rightarrow 2 < x < 8 \quad \checkmark 5p$$

$$x=2 \text{ için } \sum_{n=1}^{\infty} \frac{(-3)^n}{n3^n} = \sum_{n=1}^{\infty} \frac{(-1)^n}{n} \rightarrow \text{yakusak}$$

$$x=8 \text{ için } \sum_{n=1}^{\infty} \frac{3^n}{n3^n} = \sum_{n=1}^{\infty} \frac{1}{n} \rightarrow \text{maksek}$$

$$\text{Yakusaklık, aralığı } [2, 8) \quad \checkmark 5p$$