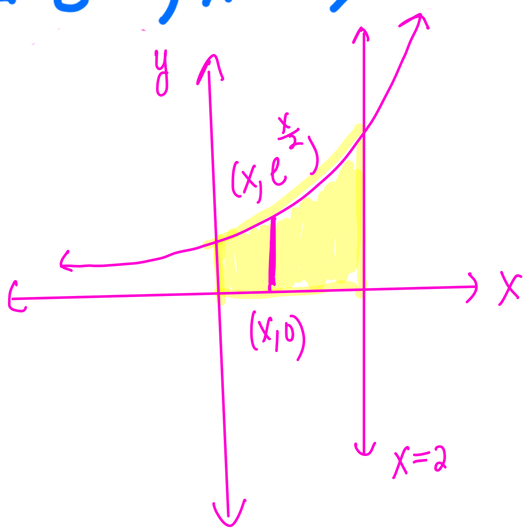
① Find the area of the curve bounded by $y = e^{\frac{x}{2}}$, $x = 0$, $x = 2$ and $y = 0$.



$$A = \int_0^2 e^{\frac{x}{2}}\, dx$$

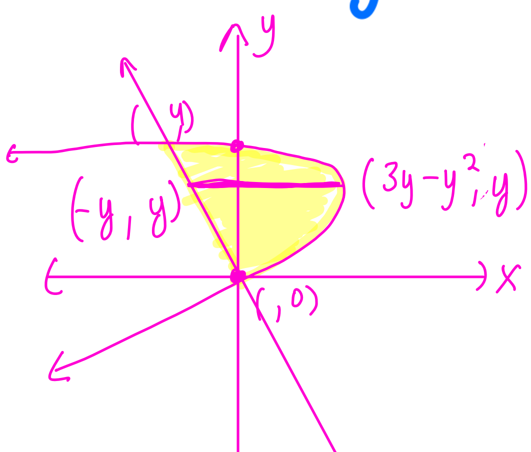
$$2e^{\frac{x}{2}} \Big|_0^2$$

$$2e - 2e^0 = 2e - 2$$

② Find the area bounded by the curve $x = 3y - y^2$ and the line $x = -y$.

let $x = 0$

$$0 = 3y - y^2$$
$$0 = y(3 - y)$$
$$y = 0, 3$$



pts of int:

$$-y = 3y - y^2$$
$$0 = 4y - y^2$$
$$0 = y(4 - y)$$
$$y = 0 \quad y = 4$$

$$A = \int_0^4 (3y - y^2 - (-y))\, dy = \int_0^4 (4y - y^2)\, dy$$

$$= 2y^2 - \frac{y^3}{3} \Big|_0^4 = 32 - \frac{64}{3} - 0 = 32 - \frac{64}{3}$$

③ Rewrite the limit of the Riemann sum as a definite integral.

$$f(a+\Delta x i)\cdot \Delta x$$

a) $$\lim_{n\to\infty}\sum_{i=1}^{n} \ln\left(2+\frac{5i}{n}\right)\cdot\frac{5}{n} \longrightarrow \Delta x = \frac{b-a}{n}$$

$f(x)=\ln x$

$a=2$

$5=b-a$

$5=b-2$

$7=b$

$$\int_2^7 \ln x \, dx$$

b) $$\lim_{n\to\infty}\sum_{i=1}^{n}\left[\sin\left(\frac{\pi}{2}+\frac{\pi i}{n}\right)\right]\cdot\underbrace{\frac{\pi}{n}}_{\Delta x} \longrightarrow b-a$$

$f(x)=\sin x$

$a=\frac{\pi}{2}$

$b-\frac{\pi}{2}=\pi$

$b=\frac{3\pi}{2}$

$$\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} \sin x \, dx$$

④ Rewrite the definite integral as a limit of a Riemann sum

a) $\int_0^3 e^x dx$

$\Delta x = \frac{3-0}{n}$

$\Delta x = \frac{3}{n}$

$f(a + \Delta x i)$

$f(0 + \frac{3i}{n})$

$f(\frac{3i}{n}) = e^{\frac{3i}{n}}$

$\lim_{n\to\infty} \sum_{i=1}^{n} e^{\frac{3i}{n}} \cdot \frac{3}{n}$

b) $\int_0^{\pi} \cos x \, dx$

$\Delta x = \frac{\pi}{n}$

$a = 0$

$f(0 + \frac{\pi}{n} i)$

$f(\frac{\pi i}{n}) = \cos(\frac{\pi i}{n})$

$\lim_{n\to\infty} \sum_{i=1}^{n} \cos(\frac{\pi i}{n}) \cdot \frac{\pi}{n}$

Calculator questions?

Questions from last exam, particularly FTC Pt II free response?

c) $\int_{\frac{\pi}{2}}^{\pi} \sin x \, dx$

$a = \frac{\pi}{2}$

$\Delta x = \frac{\pi - \frac{\pi}{2}}{n} = \frac{\frac{\pi}{2}}{n} = \frac{\pi}{2n}$

$f(\frac{\pi}{2} + \frac{\pi i}{2n})$

$\lim_{n\to\infty} \sum_{i=1}^{n} \sin(\frac{\pi}{2} + \frac{\pi i}{2n}) \cdot \frac{\pi}{2n}$

$\int_0^4 x^3\,dx$ $a=0$ $b=4$ $\Delta x = \frac{4-0}{n}$ $\frac{4}{n}$ $f(x)=x^3$ $f(0+\frac{4k}{n})$	$\lim\limits_{n\to\infty} \sum_{k=1}^{n} \left(\frac{4k}{n}\right)^3 \cdot \frac{4}{n}$
$\int_2^4 x^3\,dx$	$a+\Delta x i$ $\lim\limits_{n\to\infty} \sum_{i=1}^{n} \left(2+\frac{2i}{n}\right)^3 \cdot \left(\frac{2}{n}\right)$ $\Delta x = \frac{2}{n} = \frac{b-a}{n} = \frac{b-2}{n}$ $2=b-2$ $4=b$
$\int_2^6 x^3\,dx$ $\Delta x = \frac{6-2}{n} = \frac{4}{n}$ $a=2$	$\lim\limits_{n\to\infty} \sum_{k=1}^{n} \left(2+\frac{4k}{n}\right)^3 \cdot \frac{4}{n}$
$\int_4^6 x^3\,dx$	$a+\Delta x i$ Δx $\lim\limits_{n\to\infty} \sum_{i=1}^{n} \left(4+\frac{2i}{n}\right)^3 \cdot \left(\frac{2}{n}\right)$ $a=4$ $\frac{b-4}{n} = \frac{2}{n}$ $b-4=2$ $b=6$
$\int_2^6 (x+2)^3\,dx$ $\Delta x = \frac{6-2}{n} = \frac{4}{n}$ $a=2$ $f(2+\frac{4k}{n}) = (2+\frac{4k}{n}+2)^3$	$\lim\limits_{n\to\infty} \sum_{k=1}^{n} \left(4+\frac{4k}{n}\right)^3 \left(\frac{4}{n}\right)$
$\int_0^{\pi} \sin x\,dx$	$\sin(a+\Delta x i)$ $a=0$ Δx $\lim\limits_{n\to\infty} \sum_{i=1}^{n} \left[\sin\left(\frac{\pi i}{n}\right)\right] \cdot \left(\frac{\pi}{n}\right)$ $\frac{\pi}{n} = \frac{b-0}{n}$

$\pi = b-0$

$\pi = b$

$\Delta x = \frac{\pi - \frac{\pi}{2}}{n} = \frac{\frac{\pi}{2}}{n} = \frac{\pi}{2n}$ $\int_{\pi/2}^{\pi} \sin x \; dx$ $\quad a = \frac{\pi}{2}$ $\sin\left(\frac{\pi}{2} + \frac{\pi}{2n}k\right)$	$\lim_{n\to\infty} \sum_{k=1}^{n} \sin\left(\frac{\pi}{2} + \frac{\pi k}{2n}\right) \cdot \left(\frac{\pi}{2n}\right)$
$\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} \sin x \; dx$	$\lim_{n\to\infty} \sum_{i=1}^{n} \left[\sin\left(\frac{\pi}{2} + \frac{\pi i}{n}\right)\right] \cdot \left(\frac{\pi}{n}\right)$ a $\frac{\pi}{\cancel{n}} = \frac{b - \frac{\pi}{2}}{\cancel{n}}$ $\pi = b - \frac{\pi}{2}$ $\pi + \frac{\pi}{2} = b$ $\frac{3\pi}{2} = b$
$\Delta x = \frac{\frac{3\pi}{4} - \frac{\pi}{4}}{n} = \frac{\frac{\pi}{2}}{n} = \frac{\pi}{2n}$ $\int_{\pi/4}^{3\pi/4} \sin x \; dx$ $\quad a = \frac{\pi}{4}$	$\lim_{n\to\infty} \sum_{i=1}^{n} \sin\left(\frac{\pi}{4} + \frac{\pi i}{2n}\right) \cdot \left(\frac{\pi}{2n}\right)$
$\int_{\frac{5}{4}}^{\frac{17}{4}} \sqrt{4x} \; dx$	$\lim_{n\to\infty} \sum_{i=1}^{n} \sqrt{5 + \frac{12i}{n}} \cdot \left(\frac{3}{n}\right)$ $f(x) = \sqrt{x}$ $a + \Delta x k$ $a + \frac{3}{n}i \xrightarrow{\cdot 4} = 5 + \frac{12i}{n}$ $\Delta x = \frac{3}{n}$ $\frac{b - \frac{5}{4}}{n} = \frac{3}{n}$ $b - \frac{5}{4} = 3$ $b = \frac{17}{4}$ $4\left(a + \frac{3}{n}i\right) = 5 + \frac{12i}{n}$ $4a = 5$ $a = \frac{5}{4}$
$\int_{1}^{5} \sqrt{x} \; dx$	$\lim_{n\to\infty} \sum_{i=1}^{n} \sqrt{1 + \frac{4i}{n}} \cdot \left(\frac{4}{n}\right)$ $a = 1$ $\quad \Delta x = \frac{4}{n}$ $\frac{4}{n} = \frac{b-1}{n}$ $b = 5$
$\Delta x = \frac{5-2}{n} = \frac{3}{n}$ $\int_{2}^{5} \sqrt{1 + 4x} \; dx$ $\quad a = 2$ $\sqrt{1 + 4\left(2 + \frac{3k}{n}\right)}$	$\lim_{n\to\infty} \sum_{k=1}^{n} \sqrt{9 + \frac{12k}{n}} \left(\frac{3}{n}\right)$

$\sqrt{1 + 8 + \frac{12k}{n}}$

$\sqrt{9 + \frac{12k}{n}}$

$\int_1^4 \sqrt{x}\, dx$	Δx $\lim_{n\to\infty} \sum_{i=1}^{n} \sqrt{1+\frac{3i}{n}} \cdot \left(\frac{3}{n}\right)$ $a_1 + \Delta x i$ $a=1$ $\frac{3}{n}=\frac{b-1}{n}$ $b=4$
$\int_1^e \ln x\, dx$ $\Delta x = \frac{e-1}{n}$	$\lim_{n\to\infty} \sum_{k=1}^{n} \ln\left(1+\frac{(e-1)k}{n}\right)\left(\frac{e-1}{n}\right)$
$\int_1^{e+1} \ln x\, dx$	$a + \Delta x i$ $\quad$ Δx $\lim_{n\to\infty} \sum_{i=1}^{n} \left[\ln\left(1+\frac{e\cdot i}{n}\right)\right] \cdot \left(\frac{e}{n}\right)$ $a=1$ $\frac{b-1}{n}=\frac{e}{n}$ $b=e+1$
$\int_e^{2e} \ln x\, dx$ $\Delta x = \frac{2e-e}{n}$ $\Delta x = \frac{e}{n}$ $a=e$	$\lim_{n\to\infty} \sum_{k=1}^{n} \ln\left(e+\frac{ek}{n}\right)\left(\frac{e}{n}\right)$