Station 1: Accumulation Graphs

① The function f is increasing on [-3, -2) because $f' > 0$ at $-3 < x < -2$.

② $f(-3) = f(0) + \int_0^{-3} f'(x)\,dx$

$$3 - \int_{-3}^{0} f'(x)\,dx = 3 - (-1.5) = 4.5 \text{ or } \frac{9}{2}$$

③ $f'(0) = -2$

$$y - 3 = -2(x - 0) \text{ or } y = -2x + 3$$

④ $g(-6) = \int_{-2}^{-6} f(t)\,dt = -\frac{1}{2}(4)(5) = -10$

$g(0) = \int_{-2}^{0} f(t)\,dt = \frac{\pi}{4}(4) = \pi$

⑤ $x = -2$ & 2

$x = -2$ is neither a max or min

$x = 2$ is a local maximum.

Station 2: Integration

① $\int (x-2)\sqrt{x+3}\,dx$ $\qquad u = x+3$

$\qquad du = dx$

$= \int (u-5)u^{1/2}\,du \qquad x = u-3$

$= \int u^{3/2} - 5u^{1/2}\,du = \frac{2}{5}u^{5/2} - \frac{2}{3}(5x^{3/2} + C$

$= \frac{2}{5}(x+3)^{5/2} - \frac{10}{3}(x+3)^{3/2} + C$

② $\int \frac{5}{x\ln x}\,dx \qquad u = \ln x$

$\qquad du = \frac{1}{x}\,dx$

$5\int \frac{1}{u}\,du = 5\ln|u| + C$

$= 5\ln|\ln x| + C$

③ $\int (x^{1/3} + x^{3/2} - 2)\,dx$

$\frac{3}{4}x^{4/3} + \frac{2}{5}x^{5/2} - 2x + C$

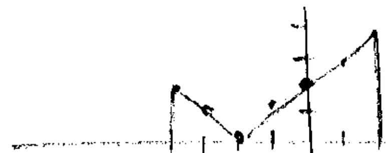
④ $\int e^{-x} + \sec^2\left(\frac{x}{3}\right)dx$

$-e^{-x} + 3\tan\left(\frac{x}{3}\right) + C$

Station 3: More Integration

① $\int_{2}^{-4} |2+x|\,dx = -\int_{-4}^{2} |2+x|\,dx$

$= -10$



$\frac{1}{2}(2)(2) + \frac{1}{2}(4)(4)$

$2 + 8 = 0$

② $\int_0^{1/2} (e^y + 2\cos(\pi y))\,dy$

$\int_0^{1/2} e^y\,dy + 2\int_0^{1/2} \cos(\pi y)\,dy$ $\quad u = \pi y$, $du = \pi\,dy$, $\frac{du}{\pi} = \frac{\pi\,dy}{\pi}$

$e^y\Big|_0^{1/2} + \frac{2}{\pi}\int_0^{\frac{\pi}{2}} \cos(u)\,du$

$e^{1/2} - 1 + \frac{2}{\pi}\left(\sin u\Big|_0^{\frac{\pi}{2}}\right) = e^{1/2} - 1 + \frac{2}{\pi}(1-0)$

$= e^{1/2} - 1 + \frac{2}{\pi}$

③ $f'(x) = \int 2x^{-2}\,dx$

$f'(x) = -2x^{-1} + C$

$1 = -2(1) + C$

$C = 3$

$f(x) = \int(-2x^{-1} + 3)\,dx$

$f(x) = -2\ln x + 3x + C$

$1 = 3 + C$

$C = -2$

$f(x) = -2\ln|x| + 3x - 2$

④ $\int_0^3 \frac{2e^{2x}}{1+e^{2x}}dx$ $\quad u = 1+e^{2x}$

$du = 2e^{2x}dx$

$\int_2^{1+e^6} \frac{1}{u}\,du$

$\ln|u|\Big|_2^{1+e^6}$ $\quad \ln(1+e^6) - \ln 2 = \ln\left(\frac{1+e^6}{2}\right)$

Station 4: Average Value + FTOC (2)

① $\frac{d}{dx}\left(\int_{\cos(x^2)}^{2x} x^2 dx\right) = (2x)^2(2) - ((\cos^2(x^2))\cdot(-\sin(x^2)(2x))$

$= 8x^2 + 2x\cos^2(x^2)\sin(x^2)$

② $F'(x) = \ln(e^{2x}+2)(2e^{2x})$

$= 2e^{2x}\ln(e^{2x}+1)$

③ $\frac{1}{\pi-0}\int_0^{\pi}(4\pi\cos t)dt = \frac{4\cancel{\pi}}{\cancel{\pi}}\int_0^{\pi}\cos t\,dt$

$= 4(\sin t\Big|_0^{\pi}) = 4((0-0)) = 0$

④ $\frac{1}{2\pi-0}\int_0^{2\pi}\cos x\,dx = \frac{1}{2\pi}(\sin x\Big|_0^{2\pi})$ $\quad 0 = \cos x$

$\frac{1}{2\pi}(0-0) = 0$ $\quad x = \frac{\pi}{2}, + \frac{3\pi}{2}$

Station 5 : Approximation

① $\frac{1}{2}\left(3\cdot 11 + 3(14) + 2(18) + 2(21) + 2(24) + 2(29)\right) = 129.5$

OR $\frac{259}{2}$

② $6(6) + 4(10) + 4(13)$

$36 + 40 + 52 = 128$

③ $\frac{1}{19-5}\left(\frac{259}{2}\right) = \frac{1}{14}\left(\frac{259}{2}\right) = \frac{37}{4}$

④ over approximation because $h'(x) > 0$