$$\int \frac{du}{u} = \ln\ |u| + K$$

$$\int \frac{f'(x)}{f(x)}\,dx = \ln\ |f(x)| + K$$

$$\int \tan\ u\,du = -\ln\ |\cos\ u| + K$$

$$\int \cot\ u\,du = \ln\ |\sin\ u| + K$$

$$\int \sec\ u\,du = \ln\ |\sec\ u + \tan\ u| + K$$

$$\int \csc\ u\,du = \ln\ |\csc\ u - \cot\ u| + K$$

1. $f(x) = \cos x$

$f'(x) = -\sin x$

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

$\Delta x = \frac{-\pi}{40}$

$f(c+\Delta x) = f(c) + f'(c)\Delta x$

$\cos\frac{19\pi}{40} \approx \cos\frac{\pi}{2} + \left(-\sin\frac{\pi}{2}\right)\left(\frac{-\pi}{40}\right)$

$= 0 + (-1)\left(\frac{-\pi}{40}\right)$

$\boxed{= \frac{\pi}{40} \approx 0.07854}$

2. $\boxed{\sec x - 10\cos x + C}$

3. $\frac{19}{12}$

4. $f''(x) = 3x^2 - \sin x$, $f(0) = 1$, $f'(0) = 2$

$$f'(x) = x^3 + \cos x + a$$
$$2 = 0^3 + \cos 0 + a$$
$$1 = a$$
$$f'(x) = x^3 + \cos x + 1$$
$$f(x) = \frac{1}{4}x^4 + \sin x + x + b$$
$$1 = 0 + \sin 0 + 0 + b$$
$$1 = b$$
$$\boxed{f(x) = \frac{1}{4}x^4 + \sin x + x + 1}$$

$$v(t) = -32t + 60$$

5. $s(t) = -16t^2 + 60t + 10$

$v(t) = 0$

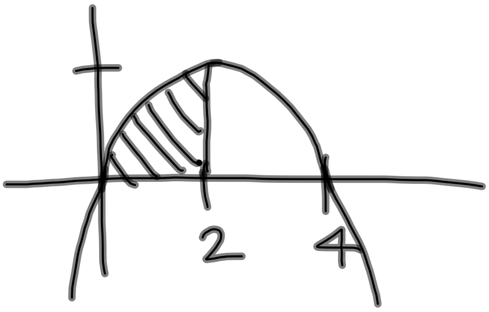
$t = 15/8$

$$s(15/8) = \boxed{\frac{265}{4}\text{ ft} \approx 66.25\text{ ft}}$$

6. 23780

7. $y = 4x - x^2$, $[0,2]$

$= x(4-x)$



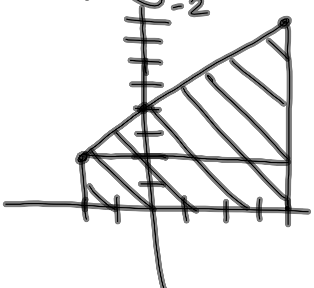
$$\lim_{n\to\infty}\sum_{i=1}^{n}\left(4\cdot\frac{2i}{n}-\left(\frac{2i}{n}\right)^2\right)\cdot\frac{2}{n}$$

$$=\boxed{\frac{16}{3}}$$

8. $$\lim_{n\to\infty}\sum_{i=1}^{n}\left(\left(1+\frac{i}{n}\right)^2+5\right)\cdot\frac{1}{n}$$

$$=\boxed{\frac{22}{3}}$$

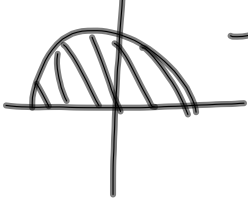
9. (a) $\int_{-2}^{4}(x+4)\,dx$



$6(2)+\frac{1}{2}(6)(6)$

$=\boxed{30}$

(b) $\int_{-4}^{4}\sqrt{16-x^2}\,dx$



$$\frac{\pi(4)^2}{2}=\boxed{8\pi}$$

10. (a) $\boxed{\int_1^3 (5x^2+2)\,dx}$

(b) $\boxed{\int_1^3 x^3(5x^2+5)\,dx}$

A. $f(x)=x^5-\frac{x^2}{2}+5x+8$

B. $\frac{27}{2}$

4.5

33. $\int (9-y)\sqrt{y}\,dy$

$= \int (9y^{1/2}-y^{3/2})\,dy$

. . .

$\sin 2\theta = 2\sin\theta\cos\theta$

47. $\int \sin 2x \cos 2x\,dx \;=\; \int \frac{1}{2}\sin 4x\,dx$

$u=\sin 2x$

$\frac{du}{2}=\cancel{2}\cos 2x\,dx$

$\frac{1}{2}\int u\,du = \frac{1}{4}u^2+C = \frac{1}{4}\sin^2 2x + C$

53. $\int \cot^2 x \, dx$

$= \int \frac{\cos^2 x}{\sin^2 x} dx$

$= \int \frac{1-\sin^2 x}{\sin^2 x} dx$

$= \int (\csc^2 x - 1) dx$

$= -\cot x - x + C$

61. $\int \frac{x^2-1}{\sqrt{2x-1}} dx$

$u = 2x-1 \qquad x = \frac{u+1}{2}$

$\frac{du}{2} = \cancel{2}dx$

$= \int \frac{\left(\frac{u+1}{2}\right)^2 - 1 \cdot \frac{4}{4}}{2\sqrt{u}} du$

$= \int \frac{u^2+2u+1-4}{8u^{1/2}} du$

$= \int \left(\frac{1}{8}u^{3/2} + \frac{1}{4}u^{1/2} - \frac{3}{8}u^{-1/2}\right) du$

$= \frac{1}{20}u^{5/2} + \frac{1}{6}u^{3/2} - \frac{3}{4}u^{1/2} + C$

63. $\int \frac{-x}{(x+1)-\sqrt{x+1}} dx = \int \frac{1-u}{u-\sqrt{u}} du$

$u = x+1 \qquad x = u-1$

$du = dx$

$= \int \frac{1-u}{u-\sqrt{u}} \cdot \frac{u+\sqrt{u}}{u+\sqrt{u}} du = \int \frac{u + u^{1/2} - u^2 - u^{3/2}}{u^2 - u}$

$u = x+1-(x+1)^{1/2}$

$du = \left[1 - \frac{1}{2}(x+1)^{-1/2}\right] dx$

$= \left[1 - \frac{1}{2\sqrt{x+1}}\right] dx$

$u = \sqrt{x+1}$

$du = \frac{1}{2\sqrt{x+1}} dx$

$2\sqrt{x+1}\, du = dx$

$2u\,du = dx$

71. $\int_1^9 \frac{1}{\sqrt{x}(1+\sqrt{x})^2}\,dx = \int_{x=1}^{x=9} \frac{du}{u^2} = -u^{-1}$

$u^{-2}du$

$u = 1+\sqrt{x}$

$du = \frac{1}{2\sqrt{x}}\,dx$

$2du = \frac{dx}{\sqrt{x}}$

$$-\frac{1}{1+\sqrt{x}}\Big|_1^9 =$$

$$\frac{-1}{1+3} - \frac{-1}{1+1}$$

$$= \frac{-1}{4} + \frac{1}{2} = \boxed{\frac{1}{4}}$$

5.2

11. $\int \frac{x^2+2x+3}{x^3+3x^2+9x}\,dx = \int \frac{du}{3u} = \frac{1}{3}\ln|x^3+3x^2+9x| + C$

$u = x^3+3x^2+9x$

$du = (3x^2+6x+9)\,dx$

$\frac{du}{3} = \cancel{3}(x^2+2x+3)\,dx$

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

$$9. \int \frac{x^2-4}{x}\,dx = \int \left(x - \frac{4}{x}\right)dx$$

$$= \frac{x^2}{2} - 4\ln|x| + C$$

$$\log_a b^c = c \cdot \log_a b$$

$$7. \int \frac{x}{x^2+1}\,dx = \int \frac{du}{2u} = \frac{1}{2}\ln|x^2+1| + C$$

$$= \ln\sqrt{x^2+1} + C$$

$u = x^2 + 1$

$\frac{du}{2} = \cancel{2}x\,dx$