[1]   Evaluate each integral.

(a) $\int \dfrac{\sqrt{1-4x^2}}{x}\,dx$

(b) $\int \csc^3 x\,dx$

(c) $\int \cos^3 x \sin^4 x \, dx$

(d) $\int \dfrac{1}{e^x + 1} \, dx$

(e) $\displaystyle\int \frac{1}{x\sqrt{4+9x^2}}\,dx$

[2] Evaluate each limit. Your answer should be a number, $\infty, -\infty$, or DNE.

(a) $\lim\limits_{x\to 0}(\cos x)^x$, form:

(b) $\lim\limits_{x\to\infty}\left(\dfrac{x+1}{x-1}\right)^x$, form:

(c) $\displaystyle\lim_{x\to\infty}\left(5+2e^{2x}\right)^{e^{-2x}}$, form:

(d) $\displaystyle\lim_{x\to\pi/2^+}\frac{1+\sec x}{2\sin x}$, form:

[3] Determine if each improper integral converges or diverges. If it converges, state its value.

(a) $\displaystyle\int_{3}^{4} \frac{1}{(x-3)^{4/3}}\,dx$

(b) $\displaystyle\int_{-\infty}^{0} e^{-2x}\,dx$

(c) $\displaystyle\int_{1}^{2} \frac{1}{x^2\sqrt{4-x^2}}\,dx$

(d) $\displaystyle\int_{0}^{+\infty} \frac{e^x}{1+e^x}\,dx$

(e) $\displaystyle\int_0^{\pi/2} \sec\theta\, d\theta$