

1. Evaluate

(a) $\sin\left(\cos^{-1}\left(-\frac{2}{3}\right)\right)$

(b) $\tan(\sec^{-1} x)$

(c) $\sin(2 \tan^{-1} x)$

(d) $\cos\left(\sin^{-1} \frac{2}{3} + \cos^{-1} \frac{3}{4}\right)$

2. Find $f'(x)$ given $f(x)$:

(a) $f(x) = \frac{1}{4} \sin^{-1}\left(\frac{4}{x^2}\right)$

(b) $f(x) = \sec^{-1}(\sqrt{x^4 + 1})$

(c) $f(x) = \tan^{-1}(\sqrt{e^{2x} - 1})$

(d) $f(x) = \tan^{-1}\left(\frac{x}{a}\right) + \tan^{-1}\left(\frac{a}{x}\right)$

(e) $f(x) = \sin^{-1}\left(\frac{1}{\sqrt{x}}\right) + \sec^{-1}\sqrt{x}$

3. Integrate

(a) $\int \frac{1}{16x^2 + 9} dx$

(b) $\int_0^{\frac{\sqrt{3}}{3}} \frac{1}{\sqrt{4 - 9x^2}} dx$

(c) $\int_1^{\sqrt{2}} \frac{1}{x\sqrt{2x^2 - 1}} dx$

(d) $\int \frac{1}{x(9 + 4 \ln^2 x)} dx$

(e) $\int \frac{e^{2x}}{\sqrt{16 - 25e^{4x}}} dx$

(f) $\int \frac{4}{\sqrt{x}(x + 9)} dx$

(g) $\int \frac{x}{\sqrt{25 - 16x^4}} dx$

(h) $\int \frac{\cos(2x)}{\sqrt{9 - \sin^2(2x)}} dx$

(i) $\int_0^{\frac{\pi}{9}} \frac{\sec^2(3x)}{9 + \tan^2(3x)} dx$

(j) $\int_0^2 \frac{1}{\sqrt{3 + 2x - x^2}} dx$

(k) $\int \frac{x - 4}{4x^2 - 4x + 17} dx$

4. Integrate by substitution

(a) $\int \frac{\sqrt{x-1}}{x+3} dx$

(b) $\int \frac{1}{x\sqrt{4x-3}} dx$