(1) Find the derivatives of $f(x)$:

(a) $f(x) = \cos(x^3 + 9x)$

Answer: $-(3x^2 + 9) \sin(x^3 + 9x)$

(b) $f(x) = \sin^8(x^3)$

Answer: $24x^2 \sin^7(x^3) \cos(x^3)$

(2) Find the indefinite integrals:

(a) $\int \sin(-25x) \, dx$

Answer: $\frac{1}{25} \cos(-25x) + C$ or $\frac{1}{25} \cos(25x) + C$

(b) $\int \frac{\cos x}{\sqrt{\sin x}} \, dx$

Answer: $2\sqrt{\sin x} + C$

(c) $\int x^2 \cos(x^3) \, dx$

Answer: $\frac{\sin(x^3)}{3} + C$

(d) $\int (x + 1) \cos(x^2 + 2x) \, dx$

Answer: $\frac{1}{2} \sin(x^2 + 2x) + C$

(3) Find the definite integrals:

(a) $\int_0^{\pi/4} \cos x \, dx$

Answer: $\sqrt{2}$

(b) $\int_0^{\pi/2} \cos x \, dx$

Answer: 1

(c) $\int_{\pi/2}^{\pi} \cos x \, dx$

Answer: -1

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

Answer: 0

(e) $\int_{\pi/6}^{\pi/3} \cos x \, dx$

Answer: $\frac{-1+\sqrt{3}}{2}$
(4) Find the trigonometric integrals:

(a) \( \int \sin^8 x \cos^3 x \, dx \)
   \[ \text{Answer: } \sin^9 x/9 - \sin^{11} x/11 + C \]

(b) \( \int \sin^4 x \, dx \)
   \[ \text{Answer: } \frac{3}{8} x - \frac{\sin(2x)}{4} + \frac{\sin(4x)}{32} + C \]

(c) \( \int \tan^6 x \sec^4 x \, dx \)
   \[ \text{Answer: } \tan^9 x/9 + \tan^7 x/7 + C \]

(d) \( \int \cot^6 x \csc^4 x \, dx \)
   \[ \text{Answer: } -\cot^9 x/9 - \cot^7 x/7 + C \]

(e) \( \int \tan^3 x \sec^5 x \, dx \)
   \[ \text{Answer: } \sec^7 x/7 - \sec^5 x/5 + C \]

(f) \( \int \cot^4 x \csc^5 x \, dx \)
   \[ \text{Answer: } -\csc^7 x/7 + \csc^5 x/5 + C \]

(g) \( \int \frac{1}{\sin^4 x \cos^2 x} \, dx \)
   \[ \text{Answer: } \tan x - 2 \cot x - \frac{\cot^3 x}{3} + C \]

(h) \( \int \frac{3 \sin x + 4 \cos x}{\sin x + 2 \cos x} \, dx \)
   \[ \text{Answer: } \frac{3}{11} x - \frac{2}{5} \ln |\sin x + 2 \cos x| + C \]

(5) A soft-drink company has revenues from sales over a 2-year period as given approximately by

\[ R(t) = 4 - 3 \cos \left( \frac{\pi t}{6} \right) \quad 0 \leq t \leq 24 \]

where \( R(t) \) is revenue (in millions of dollars) for a month of sales \( t \) months after February 1.

(a) What is the total revenue taken in over the 2-year period?
   \[ \text{Answer: } 96 \text{ million dollars.} \]

(b) What is the total revenue taken in from \( t = 6 \) to \( t = 9 \)?
   \[ \text{Answer: } 17.73 \text{ million dollars.} \]

(6) Find

\[ I = \int e^{2x} \sin(3x) \, dx \]

\[ \text{Answer: } \frac{1}{13} e^{2x} [2 \sin(3x) - 3 \cos(3x)] \]