Integration practice #3

Write the indefinite integrals

1. $\int x^4(x^2 - e).\,dx$

2. $\int \dfrac{x-2}{3-x}.\,dx$

3. $\int \sin^2 3x\,.\,dx$

4. $\int \tan 3\theta\,.\,d\theta$

Calculate the value of k from the following equations:

5. $\int_4^8 x - k\,.\,dx\ =\ 10$

6. $\int_2^3 k(x^2 - 1).\,dx\ =\ 5$

7. $\int_2^k kx - 1\,.\,dx\ =\ 5$

8. $\int_0^{\pi/5} \cos(kx)\,.\,dx\ =\ 0$

Answers: Integration practice #3

Write the indefinite integrals

1. $\int x^4(x^2 - e).dx \quad = \int x^6 + e\,x^4 .dx \;+ c \quad = \frac{1}{7}x^7 + \frac{1}{5}e x^5 + c$

2. $\int \frac{x-2}{3-x}.dx \quad = \int \frac{x-3}{3-x} + \frac{1}{3-x} .dx \quad = -x + {}^{-}\ln|3-x| + c$

3. $\int \sin^2 3x .dx \quad = \int \frac{1}{2} - \frac{1}{2}\cos 6x .dx \quad = \frac{1}{2}x - \frac{1}{12}\sin 6x + c$

4. $\int \tan 3\theta .d\theta \quad = \int \frac{\sin 3\theta}{\cos 3\theta} .dx \quad = \frac{-1}{3}\ln|\cos 3\theta| + c$

Calculate the value of k from the following equations:

5. $\int_4^8 x - k .dx = 10 \qquad [\frac{1}{2}x^2 - kx]_4^8 = 10$

$(\frac{1}{2}64 - 8k) - (\frac{1}{2}16 - 4k) = 10 \qquad k = 3.5$

6. $\int_2^3 k(x^2 - 1).dx = 5 \qquad [\frac{k}{3}x^3 - kx]_2^3 = 5$

$(\frac{k}{3}27 - k\times 3) - (\frac{k}{3}8 - k\times 2) = 5 \qquad k = 0.9375$

7. $\int_2^k kx - 1 .dx = 5 \qquad [\frac{k}{2}x^2 - x]_2^k = 5 \qquad (\frac{k}{2}k^2 - k) - (\frac{k}{2}2^2 - 2) = 5$

$\frac{1}{2}k^3 - 3k - 3 = 0 \qquad k = 2.8473$

8. $\int_0^{\pi/5} \cos(kx) .dx = 0 \qquad [\frac{1}{k}\sin kx]_0^{\pi/5} = 0 \qquad \frac{1}{k}\sin \frac{k\pi}{5} - \frac{1}{k}\sin 0 = 0$

$\frac{1}{k}\sin \frac{k\pi}{5} = 0 \qquad \frac{k\pi}{5} = n\pi \qquad k = 5n \;(\text{where } n \in \mathbb{Z})$