

1. Evaluate the following integrals:

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| (a) $\int_0^1 e^{4x+1} dx.$ | (j) $\int \frac{1}{(2x+5)^4} dx.$ | (s) $\int \frac{2t}{\sqrt{1-t}} dt.$ |
| (b) $\int_0^1 \frac{5}{1+4x^2} dx.$ | (k) $\int e^y \sqrt{5+e^y} dy.$ | (t) $\int \frac{5 \cos x}{1+\sin^2 x} dx.$ |
| (c) $\int_0^1 \frac{5x}{1+4x^2} dx.$ | (l) $\int \frac{x^3+1}{x} dx.$ | (u) $\int \frac{e^x + e^{-x}}{e^x - e^{-x}} dx.$ |
| (d) $\int_{\pi/36}^{\pi/18} \sec(6z) \tan(6z) dz.$ | (m) $\int_0^{\pi/4} \cos(2x) e^{\sin(2x)} dx.$ | (v) $\int_0^1 \frac{e^{20x} - e^{19x}}{e^{5x}} dx.$ |
| (e) $\int (t^2+1)^2 dt.$ | (n) $\int_1^2 \frac{e^{1/x}}{4x^2} dx.$ | (w) $\int_1^e \frac{dx}{x(1+\ln x)}.$ |
| (f) $\int t(t^2+1)^2 dt.$ | (o) $\int x\sqrt{x+4} dx.$ | (x) $\int_0^1 \frac{2x^3+x}{(x^4+x^2+1)^8} dx.$ |
| (g) $\int_0^1 8^{-2x} dx.$ | (p) $\int \sqrt{x} \sin(x\sqrt{x}) dx.$ | (y) $\int (x+2)e^{x^2+4x+6} dx.$ |
| (h) $\int \tan^3 x \sec^2 x dx.$ | (q) $\int_0^a x\sqrt{x^2+a^2} dx.$ | (z) $\int_4^9 \frac{2}{x+\sqrt{x}} dx.$ |
| (i) $\int \tan x \sec^6 x dx.$ | (r) $\int_0^{\pi/2} \sin x \sqrt{\cos^3 x} dx.$ | |
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2. Calculate:

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| (a) $\frac{d}{dx} \left[\int_0^x e^{t^3} dt \right].$ | (b) $\frac{d}{dx} \left[\int_{\sin(x)}^{\tan(x)} e^{t^3} dt \right].$ | (c) $\frac{d}{dx} \left[\int_{2x}^{3x} \frac{\sin(t)}{t+2} dt \right].$ |
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3. Find the average value of $f(x) = \sqrt{x}$ on the interval $[4, 9]$ and the average value of $\sin(2x)$ on the interval $[0, \pi/4]$.

4. Find the following areas:

- The area of the region under $y = x^2 - 5$ and above the x -axis, for $3 \leq x \leq 4$.
 - The area of the region lying under the curve $y = 2x - x^2$ and above the x -axis.
 - The area of the region lying above the curve $y = x^2 - 1$ and below the x -axis.
 - The area of the finite region enclosed between the curves $y = 5x$ and $y = x^2 + 4$.
 - The area of the finite region enclosed between the curves $y = 3 - x^2$ and $y = x^2 - 1$.
 - The area of the region bounded by the x -axis, positive y -axis, and the graph of $x = 4 - y^2$.
 - The area of the region bounded by the positive y -axis, the line $y = 1$, and the curve $x = y^6$.
 - The area of the region above the x -axis and below both $y = x + 2$ and $y = 4 - x^2$.
 - The area of the region above $y = -2$, below $y = 1$, to the right of $x = y^2 - 2$, and to the left of $x = y^2 + 1$.
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5. The area under the graph $y = f(x)$ of the positive function $f(x)$ between $x = 0$ and $x = a$ is equal to $a^3 + e^a - 1$. Find the function $f(x)$.
