# KEY

**1) Inactive** $\frac{1}{2}\int e^{\frac{t}{2}} dt =$

$u = \frac{1}{2}t \qquad 2du = dt \qquad 2 \cdot \frac{1}{2}\int e^u du = e^{\frac{1}{2}t} + c$

$du = \frac{1}{2}dt$

(A) $e^{-t} + C$    (B) $e^{-\frac{t}{2}} + C$    (C) $e^{\frac{t}{2}} + C$    (D) $2e^{\frac{t}{2}} + C$    (E) $e^t + C$

**2) Inactive** $\int_0^{\frac{\pi}{4}} \frac{e^{\tan x}}{\cos^2 x} dx$ is

$u = \tan x \qquad du = \frac{1}{\cos^2 x} dx \qquad \int_0^1 e^u du \qquad \begin{array}{l} u(0) = 0 \\ u(\pi/4) = 1 \end{array}$

(A) 0    (B) 1    (C) $e - 1$    (D) $e$    (E) $e + 1$    $e^1 - e^0$

$e^1 - 1$

**3) Active** If $f(x) = \frac{e^{2x}}{2x}$, then $f'(x) =$

$\frac{2x(2e^{2x}) - e^{2x} \cdot 2}{(2x)^2}$

(A) 1

(B) $\frac{e^{2x}(1-2x)}{2x^2}$

$\frac{4xe^{2x} - 2e^{2x}}{(2x)^2}$

(C) $e^{2x}$

(D) $\frac{e^{2x}(2x+1)}{x^2}$

$\frac{2e^{2x}(2x-1)}{4x^2}$

(E) $\frac{e^{2x}(2x-1)}{2x^2}$

**4) Inactive** If $f(x) = \sin(e^{-x})$, then $f'(x) =$

(A) $-\cos(e^{-x})$

(B) $\cos(e^{-x}) + e^{-x}$

(C) $\cos(e^{-x}) - e^{-x}$

(D) $e^{-x}\cos(e^{-x})$

(E) $-e^{-x}\cos(e^{-x})$

$\cos(e^{-x}) \cdot -e^{-x}$

**5) Inactive** $\int_1^e \left(\frac{x^2 - 1}{x}\right) dx =$

$\int\left(x - \frac{1}{x}\right)dx = \frac{x^2}{2} - \ln|x|\Big|_1^e \qquad \frac{e^2}{2} - \ln e - \left(\frac{1}{2} - \ln 1\right)$

(A) $e - \frac{1}{e}$    (B) $e^2 - e$    (C) $\frac{e^2}{2} - e + \frac{1}{2}$    (D) $e^2 - 2$    (E) $\frac{e^2}{2} - \frac{3}{2}$

$\frac{e^2}{2} - 1 - \frac{1}{2}$

$\frac{e^2}{2} - \frac{3}{2}$

**6) Inactive** $\int_0^1 e^{-4x} dx =$

$u = -4x \qquad -\frac{1}{4}du = dx \qquad -\frac{1}{4}\int e^u du$

$du = -4dx$

(A) $\frac{-e^{-4}}{4}$    (B) $-4e^{-4}$    (C) $e^{-4} - 1$    (D) $\frac{1}{4} - \frac{e^{-4}}{4}$    (E) $4 - 4e^{-4}$

$\frac{1}{4}\int_{-4}^0 e^u du =$

$\frac{1}{4}\left(e^u\Big|_{-4}^0\right)$

$\frac{1}{4}\left(e^0 - e^{-4}\right)$

$\frac{1}{4}\left(1 - e^{-4}\right)$

**7) Inactive** If $f(x) = \ln(x + 4 + e^{-3x})$, then $f'(0)$ is

$\frac{1}{x + 4 + e^{-3x}} \cdot (1 - 3e^{-3x})$

$\frac{1}{5} \cdot -2$

(A) $-\frac{2}{5}$    (B) $\frac{1}{5}$    (C) $\frac{1}{4}$    (D) $\frac{2}{5}$    (E) nonexistent

**8) Active** The velocity, in ft/sec, of a particle moving along the x-axis is given by the function $v(t) = e^t + te^t$. What is the average velocity of the particle from time $t = 0$ to time $t = 3$?

(A) 20.086 ft/sec

(B) 26.447 ft/sec

(C) 32.809 ft/sec

(D) 40.671 ft/sec

(E) 79.342 ft/sec

$\frac{\int_0^3 (e^t + te^t)dt}{3 - 0}$

**9) Inactive** What is the average value of $y = x^2\sqrt{x^3 + 1}$ on the interval $[0, 2]$?

$\frac{\int_0^2 x^2\sqrt{x^3 + 1}\, dx}{2}$

(A) $\frac{26}{9}$    (B) $\frac{52}{9}$    (C) $\frac{26}{3}$    (D) $\frac{52}{3}$    (E) 24

$\frac{1}{3}\int u^{1/2} du = \frac{1}{3} \cdot \frac{2}{3}u^{3/2} = \frac{2}{9}u^{3/2}\Big|_1^9 \qquad u = x^3 + 1 \qquad \frac{1}{3}du = x^2 dx \qquad \frac{\frac{2}{9}(27-1)}{2} = \frac{26}{9}$

$du = 3x^2 dx$