

9. If $\int_{-1}^1 e^{-x^2} dx = k$, then $\int_{-1}^0 e^{-x^2} dx =$ $\frac{k}{2}$

(A) $-2k$

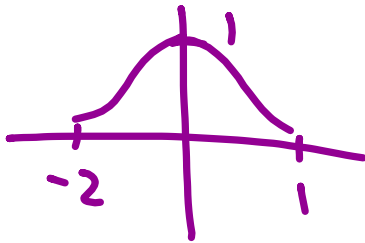
(B) $-k$

(C) $-\frac{k}{2}$

(D) $\frac{k}{2}$

(E) $2k$

$$f(-x) = f(x)$$



$$2 \int_a^a E(x) dx = \int_{-a}^a E(x) dx$$

$$0 = \int_{-a}^a 0(x) dx$$

3. If $\int_a^b f(x) dx = a + 2b$, then $\int_a^b (f(x) + 5) dx =$

(A) $a + 2b + 5$

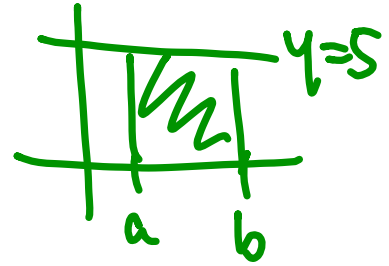
(B) $5b - 5a$

(C) $7b - 4a$

(D) $7b - 5a$

(E) $7b - 6a$

$\int_a^b f(x) dx + \int_a^b 5 dx$



$= a + 2b + 5(b - a)$

$= -4a + 7b$

15. The area of the region bounded by the lines $x=0$, $x=2$, and $y=0$ and the curve $y=e^{\frac{x}{2}}$ is

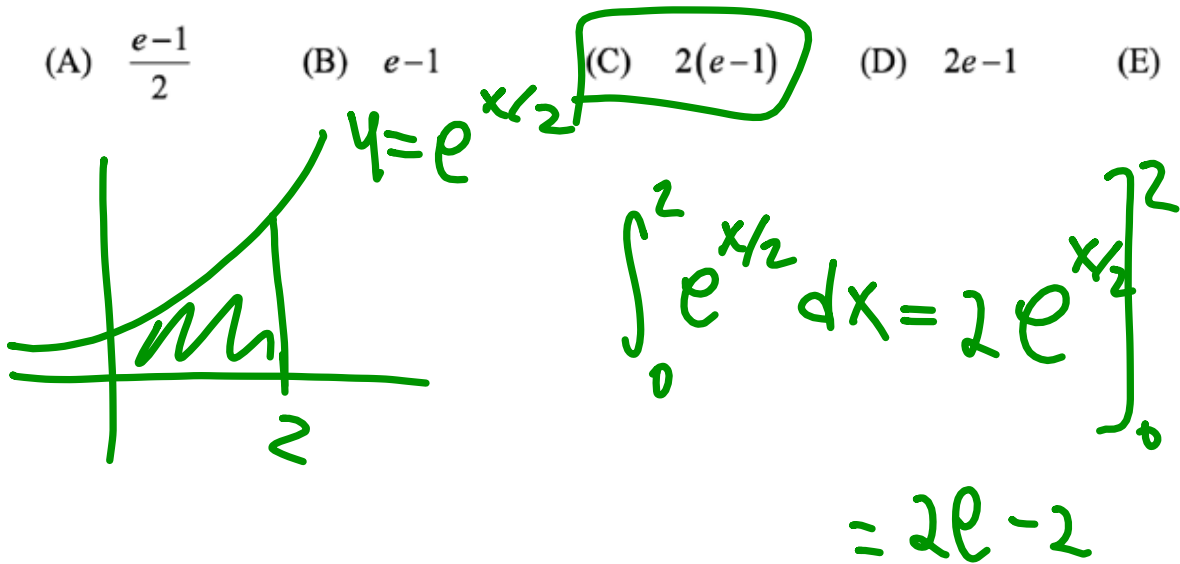
(A) $\frac{e-1}{2}$

(B) $e-1$

(C) $2(e-1)$

(D) $2e-1$

(E) $2e$



$$21. \int_0^1 (x+1)e^{x^2+2x} dx = \frac{1}{2} \int e^u du = \frac{1}{2} e^u = \frac{1}{2} e^{x^2+2x} \Big|_0^1$$

(A) $\frac{e^3}{2}$

(B) $\frac{e^3-1}{2}$

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

(D) e^3-1

(E) e^4-e

$$u = x^2 + 2x$$

$$du = (2x + 2) dx$$

$$= \frac{1}{2} e^3 - \frac{1}{2}$$

$$\frac{du}{2} = (x+1) dx$$

22. An antiderivative for $\frac{1}{x^2 - 2x + 2}$ is

(A) $-(x^2 - 2x + 2)^{-2}$

(B) $\ln(x^2 - 2x + 2)$

(C) $\ln\left|\frac{x-2}{x+1}\right|$

(D) $\operatorname{arcsec}(x-1)$

(E) $\arctan(x-1)$

Handwritten solution:

$$\frac{1}{x^2 - 2x + 2} = \frac{1}{x^2 - 2x + 1 + 1} = \frac{1}{1 + (x-1)^2}$$

Let $u = x - 1$, then $du = dx$.

$$\int \frac{1}{1 + (x-1)^2} dx = \int \frac{1}{1 + u^2} du = \arctan u + C = \arctan(x-1) + C$$

Therefore, the correct answer is (E) $\arctan(x-1)$.

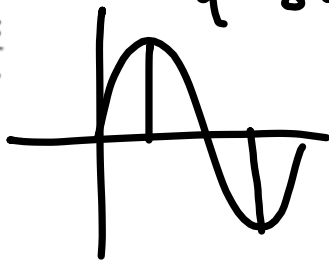
13. The region bounded by the x -axis and the part of the graph of $y = \cos x$ between $x = -\frac{\pi}{2}$ and $x = \frac{\pi}{2}$ is separated into two regions by the line $x = k$. If the area of the region for $-\frac{\pi}{2} \leq x \leq k$ is three times the area of the region for $k \leq x \leq \frac{\pi}{2}$, then $k =$

(A) $\arcsin\left(\frac{1}{4}\right)$

(B) $\arcsin\left(\frac{1}{3}\right)$

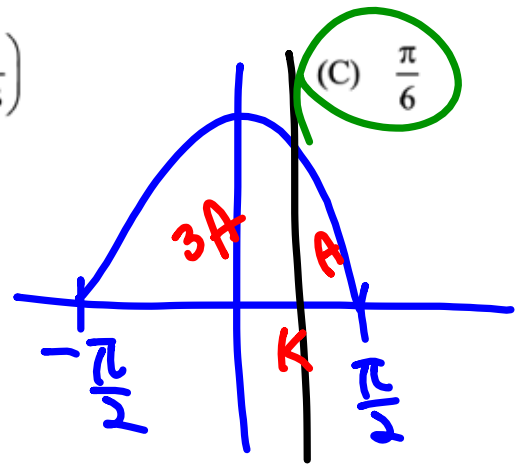
(D) $\frac{\pi}{4}$

(E) $\frac{\pi}{3}$



$$y = \cos x$$

$$\int_{-\pi/2}^{\pi/2} \cos x dx = 2$$



$$4A = 2$$

$$A = \frac{1}{2}$$

$$\int_k^{\pi/2} \cos x dx = \frac{1}{2} = \sin x \Big|_k^{\pi/2} = 1 - \sin k$$

$$\sin k = \frac{1}{2}$$

$$k = \frac{\pi}{6}$$

24. If $\int_{-2}^2 (x^7 + k) dx = 16$, then $k =$

(A) -12

(B) -4

(C) 0

(D) 4

(E) 12

$$\left. \begin{array}{l} \text{A green arrow points from the } x^7 \text{ term in the problem to the } x^8 \text{ term in the antiderivative.} \\ \frac{x^8}{8} + kx \end{array} \right]_{-2}^2 = 16$$

$$\int_{-2}^2 x^7 dx + \int_{-2}^2 k dx = 16$$

A blue bracket under the first integral is labeled with a 0.

$$4k = 16$$

$$k = 4$$