If $F(x) = c_1 x \sin x + c_2 \cos x$ is an antiderivative of $f(x) = x \cos x$.

Then $3c_1 + 5c_2 =$

If $k \geq 0$, then $\int_0^{\frac{\pi}{2}} \sin^k x \cos x \, dx =$

A) $\frac{1}{k+1}$

B) $\frac{2}{k+2}$

C) $\frac{2}{k+1}$

D) $\frac{1}{k+2}$

E) $\frac{1}{k+3}$

If $f(x) = \int_1^x \left(\frac{1}{4}t^4 - \frac{5}{3}t^3\right) dt$, then the inflection point(s) of $y = f(x)$ is(are) at $x =$

A) 1 only.

B) 3 only.

C) 0 and 3.

D) 5 only.

E) 0 and 5.

If $\int_0^1 f(3x)dx = 15$ and $\int_0^1 3f(x)dx = 15$, then $\int_1^3 f(x)dx =$

If $\int_0^2 f(x^2+1)\,dx = 6$, then $\int_2^5 7f(x^2-4x+5)\,dx =$

If $f'(x) + 4\cos x = 2 - g''(x)$, where $g(x)$ is the antiderivative of $f(x)$ and $f(\pi) = 2\pi$, then

A) $f(x) = x + 2\sin x + \frac{\pi}{2}$.

B) $f(x) = x - 2\sin x + \pi$.

C) $f(x) = x + 2\cos x + \frac{\pi}{2}$.

D) $f(x) = x - 2\cos x + \pi$.

E) $f(x) = \sin x - \cos x - \frac{\pi}{2}$.

Let $\int_0^b [\cos x\, f(x) + \sin x\, f'(x)]\, dx = 15$, where

$\tan b = -\sqrt{15}\ (0 < b \leq \pi)$. Then $\left(f(b)\right)^2 =$

If $\int_{3}^{-1} f(x)dx = 43$ and $\int_{1}^{3} f(x)dx = -2$, then $\int_{-1}^{1} (3\sin^{-1}(x) - 4f(x))dx$ equals

If $F(x) = c_1 xe^x + c_2 e^x$ is an antiderivative of $f(x) = xe^x$. Then $13c_1 - 5c_2 =$

If $F(x) = \int_{\pi}^{tanx} \sqrt[3]{u^2+1}\, du$, then $F'(x) =$

A) 0

B) π

C) $\sqrt[3]{\sec^2 x}$

D) $\sqrt[3]{\sec^4 x}$

E) $\sqrt[3]{\sec^8 x}$

If $f(x) = x^2 + \frac{8b}{x}$ has a point of inflection at $x = -2$, then $b =$

Given $0 \le \int_{e^{-3}}^{e^{3}} \sqrt{\frac{9-(\ln x)^2}{x^2}}\, dx \le m$. The minimum value of $m =$

Let $\int_0^b [\cos x \, f(x) + \sin x \, f'(x)] \, dx = 8$, where

$\tan b = -\sqrt{8}$ $(0 < b \leq \pi)$. Then $\left(f(b)\right)^2 =$

If $\int_1^2 f(x)dx = 5$ and $\int_2^5 f(x)dx = 39$, then $\int_1^2 f(3x-1)dx =$

The University of Jordan

DEPARTMENT OF MATHEMATICS

Calculus I | PROJECT A / Summer 2020 | **Due Date:** 13/08/2020

Part I: Find the absolute maximum and minimum values of $f(x) = 6x^{\frac{4}{3}} - 3x^{\frac{1}{3}}$ on $[-1,1]$.

Part II: Given $f(x) = \frac{1}{2}x^4 - \frac{4}{3}x^3 - x^2 + 4x + 1$.

(a) Find the intervals of increase and decrease.

(b) Find the local maximum and minimum values.

(c) Find the intervals of concavity and the inflection points.

(d) Use the information from parts (a)-(c) to sketch the graph.

Part III: Let $g(x) = xe^x - e^x$. Find $f(x)$ so that $f'(x) = g'(x)$ and $f(1) = 2$.

Part IV: Find the limit.

(a) $\lim_{x \to \frac{\pi}{4}} (1 - \tan x) \sec(2x)$.

(b) $\lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{\sin x}\right)$.

(c) $\lim_{x \to 0^+} \left(\frac{-1}{\ln x}\right)^x$.