

THIS IS A NO CALCULATOR QUIZ

[3 POINTS] Find a value of c that satisfies the conclusion of the Integral Mean Value Theorem if $\int_0^2 3x^2 dx = 8$.

$$\frac{1}{2-0} \int_0^2 3x^2 dx = \frac{1}{2} \cdot 8 = 4$$

$$3x^2 = 4$$

$$x = \pm \sqrt{\frac{4}{3}} = \pm \frac{2}{\sqrt{3}}$$

ONLY $C = \frac{2}{\sqrt{3}}$ IS IN THE INTERVAL $[0, 2]$

[9 POINTS] Evaluate each indefinite integral.

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

(b) $\int \frac{2x+3}{x+7} dx$

$u = x+7$
 $x = u-7$
 $du = dx$

$$\frac{2x+3}{x+7} du = \frac{2x+3}{x+7} dx$$

$$\frac{2(u-7)+3}{u} du$$

$$= \frac{2u-11}{u} du$$

$$= (2 - \frac{11}{u}) du$$

$$= \int (2 - \frac{11}{u}) du$$

$$= 2u - 11 \ln|u| + C$$

$$= 2(x+7) - 11 \ln|x+7| + C$$

$$= 2x - 11 \ln|x+7| + C$$

(c) $\int 3x^3 \sin x^4 dx = \frac{3}{4} \int \sin u du$
 $= \frac{3}{4} (-\cos u) + C$
 $= -\frac{3}{4} \cos x^4 + C$

$u = x^4$
 $\frac{du}{dx} = 4x^3$

$$\frac{du}{4x^3} = dx$$

$$3x^3 \sin x^4 \frac{du}{4x^3} = 3x^3 \sin x^4 dx$$

$$\frac{3}{4} \sin x^4 du = \frac{3}{4} \sin u du$$

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[3 POINTS]

Compute $\int_{-\frac{1}{2}}^{\frac{1}{2}} \frac{4}{\sqrt{1-x^2}} dx$ exactly.

$$\begin{aligned}
 &= 4 \arcsin x \Big|_{-\frac{1}{2}}^{\frac{1}{2}} \\
 &= 4 \left(\arcsin \frac{1}{2} - \arcsin \left(-\frac{1}{2} \right) \right) \\
 &= 4 \left(\frac{\pi}{6} - -\frac{\pi}{6} \right) = 4 \left(\frac{\pi}{3} \right) = \frac{4\pi}{3}
 \end{aligned}$$

[3 POINTS]

Find all local extrema of $f(x) = \int_0^x (t^2 - 3t + 2) dt$. SPECIFY IF THE EXTREMA ARE MAXIMA OR MINIMA.

$$\begin{aligned}
 &\frac{1}{2} \text{ NEED } f'(x) = 0 \\
 &1 \quad x^2 - 3x + 2 = 0 \\
 &\quad (x-1)(x-2) = 0 \\
 &\frac{1}{2} \quad x = 1, 2
 \end{aligned}$$

2ND DERIVATIVE TEST

$$f''(x) = 2x - 3$$

$$\frac{1}{2} \quad f''(1) = -1 < 0 \Rightarrow \text{MAX}$$

$$\frac{1}{2} \quad f''(2) = 1 > 0 \Rightarrow \text{MIN}$$

$x = 1$ IS LOCAL MAX

$x = 2$ IS LOCAL MIN

[2 POINTS]

MULTIPLE CHOICE (NO PARTIAL CREDIT)

$$\int_0^1 (\sqrt[4]{x} - x\sqrt{x}) dx =$$

[A] 1

[B] $\frac{1}{3}$

[C] 0

LETTER OF

[D] $\frac{2}{3}$

[E] $\frac{4}{15}$

[F] $\frac{2}{5}$

CORRECT ANSWER:

F

[2 BONUS POINTS]

Using an appropriate u -substitution, show that $\int_a^1 \frac{1}{x^2+1} dx = \int_1^{a^{-1}} \frac{1}{x^2+1} dx$ for $a > 0$.