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**MATH201 - Calculus-I**

**Homework Assignment #6**

**Due day: 12/7/2024**

**Instruction:**

1. **Push the answer sheet to GitHub in word file**
2. **Overdue homework submission could not be accepted.**
3. **Takes academic honesty and integrity seriously (Zero Tolerance of Cheating & Plagiarism)**
4. Find the following definite integral values
   1. b.

c. d.

a)

* **Simplify the integrand:** Rewrite as 3x1/2
* **Apply the power rule:** Using the formula ∫xn dx = +C (for n ≠ −1):

∫3x1/2 dx = 3.

Simplify the coefficient:

3. = 2x3/2

Evaluate the definite integral:

2x3/2= 2(93/2)-2(43/2)

Calculate the bounds:

* + 93/2 = (91)3/2 = 27,
  + 43/2 = (41)3/2 = 8.

2(27) − 2(8) = 54 – 16 = 38

Answer: 38

b)

**Use** integration by parts: The formula for integration by parts is ∫u dv = uv−∫v du

* Let u = ln(x), so du = dx.
* Let dv = dx, so v = x.

Substitute into the formula:

∫ln(x)dx = x ln(x) - ∫x.

Simplify:

∫ln(x)dx = x ln(x) – x + c

Evaluate the definite integral:

[x ln(x) – x]\_0^1

Calculate the bounds:

* + At x=e: e ln (e) – e = e⋅1− e = e − e = 0,
  + At x=1: 1ln (1) −1 = 1⋅0 – 1 = −1

[x ln(x) − x]\_1^e = 0 − (−1) = 1

Answer: 1

c)

Recognize the integral of the inverse cosine: The formula for the integral of cos−1(x) is:

∫cos−1(x) dx = xcos−1(x) – + c

Evaluate the definite integral: Substitute the bounds into the formula:

[xcos−1(x) − ]\_0^1

Calculate the bounds:

* + At x=1: 1⋅cos−1(1) − = 1⋅0 – 0 = 0,
  + At x=0: 0⋅cos−1(0) − = 0⋅ −1= −1

0 − (−1) = 1

Answer: 1

d)

Factor out π:

π (πx2) dx

Use symmetry: The function cos (​) is even, so:

​) dx = 2 () dx

Substitute u =: Let u = , so du = dx and dx = ​du.

* + When x = 0: u = 0,
  + When x = 1: u =​.

Substitute into the integral:

2​). du = () du

Integrate cos(u):

∫cos(u) du = sin(u)

Evaluate the bounds:

sin(u)|\_0^π/2 = [sin (- sin (0)]

* sin(π/2) = 1, sin (0) = 0:

(1−0) =

Multiply by π:

Π ⋅ = 4

Answer: 4

1. Find the following in definite integral function
   1. b.

a)

* Substitution: Let u=x3, so du=3x2 dx, and x2dx = du
* Rewrite the integral: Substitute u into the integral:

∫x2cos(x3) dx=∫cos(u)⋅ du

Simplify: Factor out :

∫x2cos(x3) dx=∫cos(u) du

Integrate cos(u):

∫cos(u) du = sin(u)

Substitute back u=x3:

sin(u) =sin(x3) + C

Answer: sin(x3) + C

b)

substitution: Let u = 1 + sin(3t), so du=3cos(3t), and cos(3t) dt= du

Rewrite the integral: Substitute u into the integral:

∫ dt = ∫⋅ du

Simplify: Factor out :

∫ dt=∫ du

Integrate ​:

∫du = ln ∣u|

Substitute back u = 1 + sin(3t):

ln ∣u∣ = ln∣1 + sin(3t) ∣ + C

Answer: ln∣1 + sin(3t) ∣ + C

1. The elevation of a path is given by , where *x* measures horizontal distance. Draw a graph of the elevation function in Excel and find its average value, for .

Average Value of the Function

The average value of a function f(x) over the interval [a, b] is given by:

Average value =

For f(x) = x3−5x2+30, a=0, and b=4, we compute:

Average value =

Integrate f(x): The integral of f(x) is:

∫(x3−5x2+30) dx = ​ − ​ + 30x + C

Evaluate the definite integral:

dx = [​ −​ +30x]04

At x=4:

​ −​ +30(4) = 64 − ​ +120

Simplify:

64+120 − = 184 − = (552−320)/3=232/3​

At x=0:

−+ 30(0) = 0

Thus:

dx=

Calculate the average value:

Average value = ⋅ = =

Answer: The average value is ​​ or approximately 19.33

A graph on a white sheet

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