1) Answer: D

Explanation: To calculate $\int x^{5}\,dx$, we have to apply the power rule for integrals.

Basically, the power rule for integrals states that the derivative of a function x^n, where *n* is a constant, is $\frac{x^{n+1}}{n+1} + C$.

In $\int x^{5}\,dx$, we have n = 5.

$\frac{x^{n+1}}{n+1} + C$

$\frac{x^{(5)+1}}{(5)+1} + C$ *input n = 5*

$\frac{x^{6}}{6} + C$

The answer is $\frac{x^{6}}{6} + C$.

2) Answer: A

Explanation: Let us apply the power rule to calculate $\int u^{3\pi}\,du$. Since we are using *u* as variable in the problem, we have

$\frac{u^{n+1}}{n+1} + C$

We have n = 3π; substituting this value of *n*:

$\frac{u^{n+1}}{n+1} + C$

$\frac{u^{(3\pi)+1}}{(3\pi)+1} + C$ *input n* = 3π

$\frac{u^{3\pi+1}}{3\pi+1} + C$

3) Answer: C

Explanation: To identify the value of $\int(3x^2 - 1)\,dx$, we have to apply first the difference rule:

$\int(3x^2 - 1)\,dx$

$\int 3x^2\,dx - \int 1\,dx$ *Difference rule*

$3 * \int x^2\,dx - \int 1\,dx$ *Multiplication of a constant rule*

$3 * (\frac{x^{2+1}}{2+1} + C) - (x + C)$ *Power rule and integral of a constant rule*

$3 * \frac{x^3}{3} - x + C$ *Simplifying*

$x^3 - x + C$

4) Answer: B

Explanation: Let us follow the steps in identifying the definite integral of a function given an upper limit and a lower limit:

Step 1: *Compute the indefinite integral of the given function.*

$$\int_{1}^{2} 3x\,dx$$

$$3 * \int_{1}^{2} x\,dx$$ *Multiplication of a constant rule*

$$3 * \frac{x^{1+1}}{1+1} + C$$ *Power rule for integrals*

$$3 * \frac{x^{2}}{2} + C$$

$$\frac{3x^{2}}{2} + C$$

Hence, the indefinite integral of the given function is $\frac{3x^{2}}{2} + C$

Step 2: *Evaluate the indefinite integral at the lower limit.*

The lower limit in the given function is 1. Hence, we evaluate $\frac{3x^{2}}{2} + C$ at x = 1:

$$\frac{3(1)^{2}}{2} + C = \frac{3}{2} + C$$

Step 3: *Evaluate the indefinite integral at the upper limit b.*

The upper limit in the given function is 2. Hence, we evaluate $\frac{3x^2}{2} + C$ at x = 2:

$\frac{3(2)^2}{2} + C = \frac{3(4)}{2} + C = \frac{12}{2} + C = 6 + C$

Step 4: *Subtract the computed value in step 2 from the computed value in step 3.*

We obtained 6 + C in step 3 while $\frac{3}{2} + C$ in step 2. Subtracting them:

$(6 + c) - \frac{3}{2} + C$

$\frac{12}{2} - \frac{3}{2}$ *Note that 6 can be written as 12/2 so that we have a similar fraction with 3/2.*

$\frac{9}{2}$

Thus, the answer is 9/2.

5) Answer: D

Explanation: A function can take an infinite number of integrals. For instance, the function 2x can have an integral equal to x^2, $x^2 + 10$, $x^2 + 0.001$, and so on. For this reason, we use an arbitrary constant, "C," to capture the infinite possibilities of a constant for an integral of a function.