Basic Differentiation

Answer Key

1) Answer: D

Explanation: Note that the given function is a product of a constant (which is ½) and a function (x^2). This means we can differentiate the given function and multiply it by the given constant.

Let us identify first the derivative of x^2 using the power rule:

Step 1: *Multiply the variable x by the constant n to obtain nx.*

We have n = 2. We multiply 2 by the given variable *x* and obtain 2x.

Step 2: *Raise x to n - 1, where n is a constant.*
Again, n = 2. This implies that n - 1 = (2) - 1 = 1. Hence, we raise *x* to the power of 1: $2x^1$

Thus, the derivative of x^2 is simply $2x^1$ or *2x*.

Now, we multiply the computed derivative of x^2 (which is 2x) by ½: ½ * 2x = x

Thus, the derivative is f'(x) = x

2) Answer: B

Explanation: We can identify the derivative of f(x) = $3x^2 - x$ by applying the difference rule for derivatives. This means that we take the derivatives of $3x^2$ and *x*, then subtract them:

Derivative of $3x^2$:
$3x^2$
$3(2x^{2-1})$ *Power rule*
$6x$

This means that the derivative of $3x^2$ is 6x.

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Derivative of x:

$1x^{1-1}$ *power rule*
x^0
1 *Zero-exponent rule*

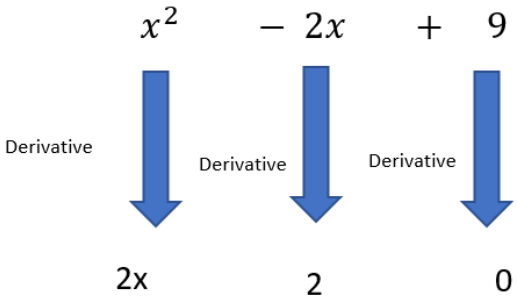
Hence, the derivative of *x* is 1.

We subtract the derivative of *x* (which is 1) from the derivative of $3x^2$ (which is $6x$): $6x - 1$.

Thus, the answer is f'(x) = 6x - 1.

3) Answer: D

Explanation: We identify the derivative of $f(x) = x^2 - 2x + 9$ by applying the sum rule and difference rule simultaneously. In other words, we take the respective derivatives of x^2, 2x, and 9 and retain the operatior



Hence, the derivative is f'(x) = 2x - 2

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4) Answer: A

Explanation: The given function, $f(x) = (2x - 1)^2$, is a composite function. Thus, we need to apply the chain rule to identify the derivative of the given function.

Let us use the steps in performing the chain rule to identify the derivative.

Step 1: *Identify the outer and inner functions.*

The outer function is x^2 while the inner function is *2x - 1*.

Step 2: *Take the derivative of the outer function.*

Recall that the outer function is x^2. By applying the power rule, its derivative is 2x.

Step 3: *Evaluate the derivative of the outer function at the inner function.*

The derivative of the outer function is *2x*. We evaluate it at the inner function *2x - 1*. This means that we need to substitute or plug-in *2x - 1* to *2x*:

2x
2(2x - 1) *plug-in 2x - 1*
4x - 2

Step 4: *Take the derivative of the inner function.*

The derivative of the inner function (which is 2x - 1) is simply 2.

Step 5: *Multiply the result in Step 3 by the result in Step 4.*

The result we obtained in step 3 is *4x - 2*. Meanwhile, the result we obtained in step 4 is 2. Multiplying them: (4x - 2)(2) = 8x - 4.

Hence, the derivative is 8x - 4.

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5) Answer: D

Explanation: The expression dy/dx means that we need to identify the derivative of *y* with respect to *x*:

Applying the differentiation rules:

$7x^2 - x^5$

Let us compute first for the derivative of $7x^2$:

$7x^2$

$7 * x^2$

$7 * 2x^{2-1}$ *power rule*

$14x$

Therefore, the derivative of $7x^2$ is $14x$.

Now, let us compute for the derivative of x^5:

x^5
$5x^{5-1}$ *power rule*
$5x^4$

Therefore, the derivative of x^5 is $5x^4$.

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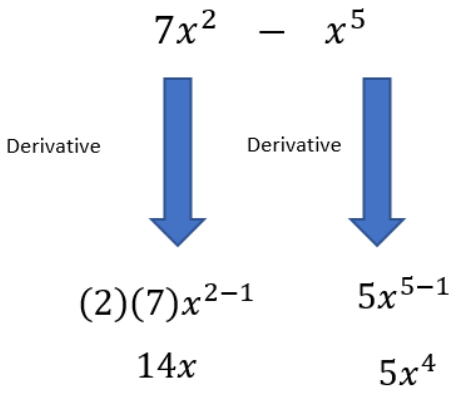

This means that the derivative of $7x^2 - x^5$ should be $14x - 5x^4$.