Differentiation Rules Quiz Questions and Answers PDF

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Which of the following functions have a derivative of zero? (Select all that apply)

- ☐ **f(x) = 5 ✓**
- ☐ f(x) = x^0
- ☐ **f(x) = ln(1) ✓**
- ☐ **f(x) = e^0 ✓**

> Functions that have a derivative of zero are constant functions, as their rate of change is zero at all points. Therefore, any function that does not change value regardless of the input will have a derivative of zero.

What is the derivative of sin(x)?

- ◯ -sin(x)
- ◯ **cos(x) ✓**
- ◯ tan(x)
- ◯ -cos(x)

> The derivative of the sine function is the cosine function, which is a fundamental result in calculus. This relationship is crucial for understanding the behavior of trigonometric functions in calculus and physics.

What is the derivative of a constant function f(x) = 7?

- ◯ 7
- ◯ **0 ✓**
- ◯ 1
- ◯ Undefined

> The derivative of a constant function is always zero, as constant functions do not change with respect to their input variable.

Which of the following are derivatives of inverse trigonometric functions? (Select all that apply)

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- ☑ $\frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1-x^2}}$ ✓
- ☐ $\frac{d}{dx}(\arccos x) = \frac{1}{\sqrt{1-x^2}}$
- ☑ $\frac{d}{dx}(\arctan x) = \frac{1}{1+x^2}$ ✓
- ☑ $\frac{d}{dx}(\arccos x) = -\frac{1}{\sqrt{1-x^2}}$ ✓

> The derivatives of inverse trigonometric functions include the derivatives of arcsin, arccos, arctan, arccot, arcsec, and arccsc. Each of these functions has a specific derivative formula that is essential for calculus applications.

Which rules are used in differentiating f(x) = x^2 * e^x? (Select all that apply)

- ☑ **Power Rule** ✓
- ☑ **Product Rule** ✓
- ☐ Chain Rule
- ☐ Quotient Rule

> To differentiate the function f(x) = x^2 * e^x, the product rule and the chain rule are applied. The product rule is used because the function is a product of two functions, and the chain rule is used for differentiating the exponential function e^x.

Which of the following are derivatives of trigonometric functions? (Select all that apply)

- ☑ $\frac{d}{dx}(\sin x) = \cos x$ ✓
- ☐ $\frac{d}{dx}(\cos x) = \sin x$
- ☑ $\frac{d}{dx}(\tan x) = \sec^2 x$ ✓
- ☑ $\frac{d}{dx}(\sec x) = \sec x \tan x$ ✓

> The derivatives of trigonometric functions include the derivatives of sine, cosine, tangent, cosecant, secant, and cotangent. Specifically, the derivatives are: d/dx(sin x) = cos x, d/dx(cos x) = -sin x, d/dx(tan x) = sec² x, and so on.

What is the derivative of ln(x)?

- ○ x
- ○ **1/x** ✓
- ○ ln(x)
- ○ e^x

> The derivative of the natural logarithm function, ln(x), is 1/x for x > 0. This means that as x increases, the rate of change of ln(x) decreases, approaching zero as x approaches infinity.

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What is the derivative of e^x?

○ **e^x ✔**
○ x * e^{x-1}
○ x * e^x
○ ln(x)

> The derivative of the function e^x is e^x itself, which is a unique property of the exponential function with base e.

Which rule is used to differentiate the function f(x) = x^5?

○ Product Rule
○ Quotient Rule
○ **Power Rule ✔**
○ Chain Rule

> To differentiate the function f(x) = x^5, we use the power rule, which states that the derivative of x^n is n*x^(n-1). In this case, applying the power rule gives f'(x) = 5x^4.

Which rule would you apply to differentiate f(x) = 3x^2 + 4x?

○ Constant Rule
○ **Sum Rule ✔**
○ Product Rule
○ Quotient Rule

> To differentiate the function f(x) = 3x^2 + 4x, you would apply the power rule, which states that the derivative of x^n is n*x^(n-1).

Which of the following functions require the chain rule for differentiation? (Select all that apply)

☐ **f(x) = (3x^2 + 2)^5 ✔**
☐ f(x) = x^3 + 4x
☐ **f(x) = sin(2x) ✔**
☐ **f(x) = e^{3x} ✔**

> The chain rule is necessary for differentiating composite functions, where one function is nested inside another. Functions that involve such compositions, like f(g(x)), require the application of the chain rule to find their derivatives correctly.

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Which rule is used to differentiate f(x) = x^3 * ln(x)?

◯ Chain Rule
◯ Quotient Rule
◯ **Product Rule ✓**
◯ Power Rule

> To differentiate the function f(x) = x^3 * ln(x), the product rule is used because it is the product of two functions: x^3 and ln(x). The product rule states that the derivative of a product of two functions is given by f'(x) = u'v + uv', where u and v are the two functions being multiplied.

Which rules are applicable for differentiating f(x) = ln(x) / x^2? (Select all that apply)

☐ **Quotient Rule ✓**
☐ Product Rule
☐ Chain Rule
☐ **Power Rule ✓**

> To differentiate the function f(x) = ln(x) / x^2, the Quotient Rule and the Chain Rule are applicable. The Quotient Rule is used for functions that are the ratio of two differentiable functions, while the Chain Rule is used for composite functions.

Which rule is used to differentiate f(x) = x^2 / (x+1)?

◯ Power Rule
◯ Chain Rule
◯ **Quotient Rule ✓**
◯ Product Rule

> To differentiate the function f(x) = x^2 / (x+1), you would use the Quotient Rule, which is applied when differentiating a function that is the ratio of two other functions.

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