Integration by Parts Quiz

A general method of integration is integration by parts. The pattern is given by:
\[ \int u \, dv = uv - \int v \, du \]

MULTIPLE CHOICE
Identify the letter of the choice that best completes the statement, or answers the question:

1. If the integrand involves a logarithm, an inverse trigonometric function, or a tough function to integrate whose derivative is easily calculated, that function should be:
   - the dv in \[ u \, dv \]
   - the u in \[ u \, dv \]

2. If the integrand involves a polynomial multiplied by a sine or a cosine, an exponential function, or some easily-integrated function, the polynomial should be:
   - the dv in \[ u \, dv \]
   - the u in \[ u \, dv \]

3. Integration by parts is called that because
   - it is the inverse of the Product Rule for differentiation
   - the technique only performs a part of the original integration
   - the integrand is split into parts
   - it is the inverse of the Chain Rule for differentiation

4. Complete: \[ \int x \sin x \, dx = \sin x - _____ + c, \] where c is a constant
   - \[ x \cos x \]
   - \[ \sin^2 x \]
   - \[ x \]
   - none of the above

5. Complete: \[ \int x \cos x \, dx = \cos x + _____ + c, \] where c is a constant
   - \[ \sin x \]
   - \[ x \sin x \]
   - \[ x \]
   - none of the above
6. Complete: \( \int x \cos 2x \, dx = \frac{x}{2} \sin 2x + ____ + c \), where \( c \) is a constant

   A. \( \cos 2x \)
   B. \( 2 \cos x \)
   C. \( \frac{1}{2} \cos 2x \)
   D. none of the above

7. Complete: \( \int x^2 \cos x \, dx = ____ + 2x \cos x - 2 \sin x + c \), where \( c \) is a constant

   A. \( x^2 \cos x \)
   B. \( \sin^2 x \)
   C. \( x^2 \sin x \)
   D. none of the above

8. Complete: \( \int x^2 \ln x \, dx = ____ - \frac{x^3}{9} + c \), where \( c \) is a constant

   A. \( \frac{x^3}{3} \ln x \)
   B. \( \ln x \)
   C. \( \frac{1}{x} \)
   D. none of the above

9. Complete: \( \int \ln x \, dx = ____ - x + c \), where \( c \) is a constant

   A. \( x \)
   B. \( x \ln x \)
   C. \( \ln x \)
   D. none of the above

10. Complete: \( \int x^3 e^x \, dx = (______) \cdot e^x + c \), where \( c \) is a constant

    A. \( x^3 \)
    B. \( x^3 + 3x^2 - 6x + 6 \)
    C. \( x^3 - 3x^2 + 6x - 6 \)
    D. none of the above

Bonus:

11. Complete: \( \int \cos^2 x \, dx = ____ + \frac{x}{2} + c \), where \( c \) is a constant

    A. \( x^2 \)
    B. \( \frac{\cos x \sin x}{2} \)
    C. \( \sin^2 x \)
    D. none of the above

SOLUTIONS

11. B