Note: The incorrect answers have been deleted and the correct answer left in place.

1.

$$\int 4x^2 + 3x + 1 \; dx =$$

(B)

$$\frac{4}{3}x^3 + \frac{3}{2}x^2 + x + C$$

2.

$$\int xe^x \; dx =$$

(C)

$$xe^x - e^x + C$$

(Check with the product rule for derivatives.)

3.

$$\int x(x^2 + 1)^{3/2} \; dx =$$

(D)

$$\frac{1}{5}(x^2 + 1)^{5/2} + C$$

(Check with the chain rule for derivatives.)

4.

$$\int x \cos(3x^2) \; dx =$$

(C)

$$\frac{1}{6}\sin(3x^2) + C$$

(Check with the chain rule for derivatives.)

5.

$$\int \sin(x)\cos(x) \; dx$$

(A)

$$\frac{-1}{2}\cos^2(x) + C$$

(C)

$$\frac{1}{2}\sin^2(x) + C$$

Both are correct by the chain rule for derivatives. Note also that these are equivalent by the trig indentity

$$\sin^2(x) + \cos^2(x) = 1.$$

Every function in the form (A) can also be written in the form (C), but with a different constant value.

6.

$$\int \frac{1}{1+x^2}\, dx$$

(B)

$$\tan^{-1}(x) + C = \arctan(x) + C$$