## Summary of Antiderivative Formulas

**1. If we have a function $y = x^n$** , then the function that gives y as its derivative is found by using the

**Power Rule:** $\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$ (note that this is *just the reverse* of the power rule for derivatives)

**2. Constant Multiplier Rule:** $\int kf(x)dx = k\int f(x)dx$ (says you can factor out a constant, same as with derivatives)

**3. Sum Rule:** $\int [f(x) \pm g(x)]dx = \int f(x)dx + \int f(x)dx$ (says you can find the antiderivative function term by term, same as with derivatives)

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**Special Functions**

4. $\int \frac{1}{x}dx = \ln|x| + C$ (Why do you suppose we need the absolute value of the input here in the answer?)

5. $\int e^x\,dx = e^x + C$ (Should be easy to remember!)

6. $\int b^x\,dx = \frac{b^x}{\ln b} + C$ (just the reverse of the derivative: in f*inding the derivative* of $b^x$ , we *multiply* by the constant ln(b) , here in the *antiderivative* we *divide* by the constant ln(b)

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## Calculating Antiderivatives (Integrals)

**Find the general antiderivative (indefinite integral) function in each case. Check by finding the derivative of your answer.**

1. $\int \left(2x^3 - 4x^2 + 3x + 1\right)dx$

2. $\int 3e^x\,dx$

3. $\int 2.2(1.03)^x\,dx$

4. $\int \frac{2}{x}dx$

5. $\int \left(\frac{1}{x^2}+\sqrt{x}\right)dx$

6. $\int \left(\frac{1}{3}x+\frac{1}{3x}+(.3)^x\right)dx$

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## **Calculating Antiderivatives (Integrals)** and solving for the constant

In problems 7 and 8, find *F*, the antiderivative of *f,* given both the derivative f **and** enough information to solve for the constant C. (Hint: find the antiderivative as usual, then substitute the given values for x and y and solve for C. Then plug the value of C back into the antiderivative function F. )

7. $f(x)=2x+1\ ,\ F(1)=4$

8. $f(x)=\frac{3}{x}+x\ ,\ F(2)=5$

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## Applications

1. An investment worth \$2 million in 1980 has been growing at a rate of $f(t)=0.12(1.08)^t$ million dollars per year *t* years after 1980.

a) Find the amount function and determine the current value of the investment.

b) Determine how much the investment has grown since 1980.

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2. The following table gives the increase or decrease in the number of donors to a college athletics support program for selected years.

| Year | 1975 | 1978 | 1981 | 1984 | 1987 | 1990 |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Donors Per Year | –169 | 803 | 1222 | 1087 | 399 | –842 |

a) Find a model for the rate of change in the number of donors.

b) Find a model for the number of donors. Use the fact that in 1980 there were 10,706 donors.

c) Estimate the number of donors in 1992.

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