

# Math 307 Integral Review

Try to do the following integrals. You should be able to do all the integrals without a star. The starred integrals are more challenging, and they may require a little inspiration beyond the basic method and may require you to combine techniques.

## Integration by Parts

1.

$$\int x e^x dx$$

2.

$$\int x \sin x dx$$

3. (\*)

$$\int e^x \sin x dx$$

4. (\*)

$$\int \log x dx$$

[In this class, log will always refer to the natural log.]

2.

$$\int \sin(2x) \cos(x) + \sin(x) \cos(2x) dx$$

3.

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

[The integrand is the derivative of a familiar inverse trig function. If you remember which function, there's no work to do. Otherwise, try the substitution  $x = \tan y$ .]

4.

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

5.

$$\int \frac{1}{\sqrt{1-x^2}} dx$$

[The same comment applies here as in the first problem, though a different substitution is needed.]

## Substitution

1.

$$\int \frac{4x}{(1+x^2)^2} dx$$

2.

$$\int x e^{x^2} dx$$

3. (\*)

$$\int x^3 e^{x^2} dx$$

6.

$$\int \frac{1}{\sqrt{-x^2 + 2x + 3}} dx$$

## Trig Identities/Substitution

1.

$$\int \sin^2(x) dx$$

## Partial Fractions

1.

$$\int \frac{x}{x^2 - 2x - 3} dx$$

2. (\*)

$$\int \frac{1+x}{x^3 - 2x^2 + x} dx$$

3. (\*)

$$\int \frac{x^2}{x^2 - 5x + 6} dx$$