Math 2924, Fall 2022 — Exam 2 Fact Sheet

Trig identities. $\sin 2\theta = 2\sin\theta\cos\theta$

$$\sin^2\theta + \cos^2\theta = 1, \quad \tan^2\theta + 1 = \sec^2\theta, \quad \cos^2\theta = \frac{1}{2}(1+\cos 2\theta), \quad \sin^2\theta = \frac{1}{2}(1-\cos 2\theta)$$

$$\sin\frac{\pi}{6} = \frac{1}{2}, \quad \sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}, \quad \cos\frac{\pi}{6} = \frac{\sqrt{3}}{2}, \quad \cos\frac{\pi}{3} = \frac{1}{2}, \quad \sin\frac{\pi}{4} = \cos\frac{\pi}{4} = \frac{\sqrt{2}}{2}$$

Some derivatives and antiderivatives.

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

$$\frac{d}{dx}\csc(x) = -\csc(x)\cot(x) \qquad \frac{d}{dx}\sec(x) = \sec(x)\tan(x) \qquad \frac{d}{dx}\cot(x) = -(\csc(x))^2$$

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

Comparison theorem for improper integrals.
Suppose f and g are continuous functions with $0 \le g(x) \le f(x)$ for x in $[1, \infty)$.

- If $\int_1^\infty f(x)\ \mathrm{dx}$ is convergent, then $\int_1^\infty g(x)\ \mathrm{dx}$ is also convergent.
- If $\int_1^\infty g(x)\ \mathrm{dx}$ is divergent, then $\int_1^\infty f(x)\ \mathrm{dx}$ is also divergent.