MATH 101 Test 1 Formulas

The essentials you should know

The following formulas are new for MATH 101. They are the most important formulas from sections 5.7-5.9 and 7.1-7.5. You should know all of these for Test 1 (and the final exam) in addition to MATH 100 and precalculus formulas, identities, etc.

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

$$\int \frac{dx}{\sqrt{a^2-x^2}} = \arcsin\frac{x}{a} + C \qquad \int \frac{dx}{a^2+x^2} = \frac{1}{a}\arctan\frac{x}{a} + C$$

$$\sinh x = \frac{e^x - e^{-x}}{2} \qquad \cosh x = \frac{e^x + e^{-x}}{2} \qquad \tanh x = \frac{\sinh x}{\cosh x}$$

$$\operatorname{csch} x = \frac{1}{\sinh x} \qquad \operatorname{sech} x = \frac{1}{\cosh x} \qquad \coth x = \frac{1}{\tanh x}$$

$$\cosh^2 x - \sinh^2 x = 1$$

$$\frac{d}{dx}[\sinh x] = \cosh x \qquad \frac{d}{dx}[\cosh x] = \sinh x \qquad \frac{d}{dx}[\tanh x] = \operatorname{sech}^2 x$$

$$\int \cosh x \ dx = \sinh x + C \qquad \int \sinh x \ dx = \cosh x + C \qquad \int \operatorname{sech}^2 x \ dx = \tanh x + C$$

$$\frac{d}{dx}[\sinh^{-1} x] = \frac{1}{\sqrt{x^2+1}} \qquad \frac{d}{dx}[\cosh^{-1} x] = \frac{1}{\sqrt{x^2-1}} \qquad \frac{d}{dx}[\tanh^{-1} x] = \frac{1}{1-x^2}$$

$$\int \frac{dx}{\sqrt{x^2+a^2}} = \sinh^{-1}\frac{x}{a}+C \qquad \int \frac{dx}{\sqrt{x^2-a^2}} = \cosh^{-1}\frac{x}{a}+C \qquad \int \frac{dx}{a^2-x^2} = \frac{1}{a}\tanh^{-1}\frac{x}{a}+C$$

$$\text{Area: } A = \int_a^b [f(x) - g(x)]\,dx \quad \text{or} \quad \int_c^d [f(y) - g(y)]\,dy$$

$$\text{Volume by Disk Method: } V = \pi \int_a^b [R(x)]^2\,dx \quad \text{or} \quad \pi \int_c^d [R(y)]^2\,dy$$

$$\text{Volume by Washer Method: } V = \pi \int_a^b ([R(x)]^2 - [r(x)]^2)\,dx \quad \text{or} \quad \pi \int_c^d ([R(y)]^2 - [r(y)]^2)\,dy$$

$$\text{Volume by Shell Method: } V = 2\pi \int_a^b p(x)h(x)\,dx \quad \text{or} \quad 2\pi \int_c^d p(y)h(y)\,dy$$

$$\text{Volume with Known Cross Sections: } V = \int_a^b A(x)\,dx \quad \text{or} \quad \int_c^d A(y)\,dy$$

$$\text{Arc Length: } s = \int_a^b \sqrt{1 + [f'(x)]^2}\,dx \quad \text{or} \quad \int_c^d \sqrt{1 + [g'(y)]^2}\,dy$$

$$\text{Surface Area: } S = 2\pi \int_a^b r(x)\sqrt{1 + [f'(x)]^2}\,dx \quad \text{or} \quad 2\pi \int_c^d r(y)\sqrt{1 + [g'(y)]^2}\,dy$$

$$\text{Hooke's Law: } F(x) = kx$$

$$\text{Work: } W = \int_a^b F(x)\,dx$$