

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.

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

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

$$\frac{d}{dx}[\arctan x] = \frac{1}{1+x^2}$$

$$\frac{d}{dx}[\operatorname{arcsec} x] = \frac{1}{|x|\sqrt{x^2-1}}$$

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

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

$$\int \frac{dx}{x\sqrt{x^2-a^2}} = \frac{1}{a} \operatorname{arcsec} \frac{|x|}{a} + C$$

$$\sinh x = \frac{e^x - e^{-x}}{2}$$

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

$$\tanh x = \frac{\sinh x}{\cosh x}$$

$$\operatorname{csch} x = \frac{1}{\sinh x}$$

$$\operatorname{sech} x = \frac{1}{\cosh x}$$

$$\operatorname{coth} x = \frac{1}{\tanh x}$$

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

$$\frac{d}{dx}[\sinh x] = \cosh x$$

$$\frac{d}{dx}[\cosh x] = \sinh x$$

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

$$\int \cosh x \, dx = \sinh x + C$$

$$\int \sinh x \, dx = \cosh x + C$$

$$\int \operatorname{sech}^2 x \, dx = \tanh x + C$$

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

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

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

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

Volume (Known Cross Sections): $V = \int_a^b A(x) dx$ or $\int_c^d A(y) dy$

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

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

Work: $W = \int_a^b F(x) dx$ or $\int_c^d F(y) dy$

Hooke's Law: $F(x) = kx$