TMTH 114
Midterm Exam Formula Sheet

Chapter 8: Factoring $(a \pm b)^2 = a^2 \pm 2ab + b^2$ $a^2 - b^2 = (a - b)(a + b)$

Chapter 9: Fractions $\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$ $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c} = \frac{ad}{bc}$

Chapter 13: Exponents and Radicals

$\sqrt[n]{a} = a^{1/n}$ $a^{m/n} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$

Given nonzero real numbers x and y, and integers m and n :

$x^1 = x$ $x^0 = 1$ $x^{-n} = \frac{1}{x^n}$

$(x^m)^n = x^{m \cdot n}$ $x^m \cdot x^n = x^{m+n}$ $\frac{x^m}{x^n} = x^{m-n}$

$(xy)^n = x^n y^n$ $\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$ $\left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^n$

Chapter 19: Ratio, Proportion, and Variation

Direct Variation: $y = kx$ or $\frac{y_2}{y_1} = \frac{x_2}{x_1}$

Power Variation: $y = kx^n$ or $\frac{y_2}{y_1} = \frac{(x_2)^n}{(x_1)^n}$

Inverse Variation: $y = \frac{k}{x}$ or $\frac{y_2}{y_1} = \frac{x_1}{x_2}$

Joint Variation: $y = kxw$

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Chapter 20: Exponential and Logarithmic Functions

Growth: $y = ae^{nt}$ *Decay:* $y = ae^{-nt}$ *Growth to an Upper Limit:* $y = a\,(1 - e^{-nt})$

Exponential Form: $y = b^x$ *Logarithmic Form:* $\log_b y = x$

Properties of logarithms (where $b, M, N > 0$, $b \neq 1$, and p is a real number):

$\log_b MN = \log_b M + \log_b N$ $\log_b \frac{M}{N} = \log_b M - \log_b N$

$\log_b M^p = p \cdot \log_b M$ $\log_b 1 = 0$ $\log_b b = 1$

$\log_b b^M = M$ $b^{\log_b M} = M$ $\log_b a = \frac{\log a}{\log b} = \frac{\ln a}{\ln b}$

Common logarithm: $\log x = \log_{10} x$

Natural logarithm: $\ln x = \log_e x$, where $e \approx 2.718$