

## Formulas for Exam 3 and Final Exam

a) Laws of Exponents

$$\begin{array}{lll}
 a^m a^n = a^{m+n} & \frac{a^m}{a^n} = a^{m-n} & (a^m)^n = a^{mn} \\
 a^m b^m = (ab)^m & \frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m & a^0 = 1 \\
 a^{-m} = \frac{1}{a^m} & a^{1/m} = \sqrt[m]{a} &
 \end{array}$$

b) Quadratic equation  $ax^2 + bx + c = 0$ . Solutions:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

c) Line and related formulas.

1. Slope-Intercept:  $y = mx + b$                       Point-Slope:  $y - y_1 = m(x - x_1)$
2. Slope:  $m = \frac{y_2 - y_1}{x_2 - x_1}$
3. Parallel lines:  $m_1 = m_2$ .                      Perpendicular lines:  $m_1 = -1/m_2$ .
4. If  $y_1$  and  $y_2$  are  $y$ -values of a function that correspond to  $x$ -values  $x_1$  and  $x_2$  respectively,
  - i) The average rate of change in  $y$ -values between  $x_1$  and  $x_2$  is  $m = \frac{y_2 - y_1}{x_2 - x_1}$
  - ii) Evaluating function at  $x = x_m$  using just the two points  $(x_1, y_1)$  and  $(x_2, y_2)$  :

$$y_1 + m(x_m - x_1) \quad \text{or} \quad y_2 + m(x_m - x_2)$$

d) Matrices: **2nd, MATRIX**. The command **rref** is under **MATH** in **2nd, MATRIX**.

e) Regressions:

- To enable scatterplot: **2nd, STAT PLOT, ENTER**. Switch from **OFF** to **On**.
- To edit the data: **STAT, EDIT**.
- To run a regression: **STAT, CALC**, choose a regression, **Y<sub>1</sub>, ENTER**. To display **Y<sub>1</sub>: VARS, Y-VARS, ENTER, ENTER**.
- To see the scatterplot: **ZOOM, ZoomStat**.

f) Hardy-Weinberg Theorem:

$$p + q = 1 \quad (p + q)^2 = p^2 + 2pq + q^2 = 1$$

g) Exponential model:  $y = y_0 a^x = y_0 e^{kx}$ .

Power model:  $y = cx^r$ . In this case  $\ln y = \ln c + r \ln x$ .

h) Properties of logarithmic function.

$$\begin{array}{ll}
 \log_a(x \cdot y) = \log_a x + \log_a y & \log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y \\
 \log_a(x^r) = r \log_a x & \log_a x = \frac{\log x}{\log a} = \frac{\ln x}{\ln a}
 \end{array}$$

i) Trigonometric identities.

$$\begin{array}{ll}
 \sin^2 x + \cos^2 x = 1 & \\
 \tan x = \frac{\sin x}{\cos x} & \cot x = \frac{\cos x}{\sin x} \\
 \sec x = \frac{1}{\cos x} & \csc x = \frac{1}{\sin x}
 \end{array}$$