Formula Sheet

You are not allowed to use this formula sheet in the test. I have compiled this list from the material which lends itself easily to be put into equation form. Consequently, this list does not include all of the material that you need to know for the test. For example, the algorithm of matrix reduction is not included here. That said, I hope you'll find it useful in your preparation.

(1) (a) $p =$ price per unit

$q =$ number of units sold

$R =$ Revenue $=$ The amount of money you have in your pocket after the sale

$R = p \cdot q$

(b) $c =$ cost per unit

$H =$ overhead $=$ the expenses that don't depend on level of production

$q =$ number of units manufactured

$C =$ Total cost

$C = H + c \cdot q$

(c) $P =$ profit

$P = R - C$

(2) The solutions of the quadratic equation

$$ax^2 + bx + c = 0$$

are

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The number under the square root $\Delta = b^2 - 4ac$ is called the *descriminant* of the quadratic equation.

- If $\Delta > 0$ there are two solutions.
- If $\Delta = 0$ there's is one solution.
- If $\Delta < 0$ there are no solutions.

(3) The slope-intercept form of a line L is $y = ax + b$ where a is the *slope* of L and b is the y-intercept of L.

(4) The slope of a line L, that goes through (x_1, y_1) and (x_2, y_2) is:

$$a = \frac{y_2 - y_1}{x_2 - x_1}$$

b is found by plugging (x_1, y_1) and a in the equation $y = ax + b$.

(5) The quadratic function $f(x) = ax^2 + bx + c$

- Opens up if $a > 0$ opens down if $a < 0$
- The y-intercept is where the parabola meets the y-axis, and equals: $y_{\text{int}} = c$.
- The x-intercepts is where the parabola meets the x-axis (if at all). They are found by setting $f(x) = 0$ and solving for x as in 2.
- The vertex of the parabola is found at $x_{\text{ver}} = -\frac{b}{2a}$ and $y_{\text{ver}} = f(x_{\text{ver}}$
- The axis of symmetry has the equation $x = x_{\text{ver}}$

(6) The domain of definition of a function $f(x)$ is the range of xs that you may plug into f (and it would make sense). For instance, the domain of $g(x) = \frac{1}{x}$ is $\{x|x \neq 0\}$.

(7) When you are told to find the height as a function of the weight it means y is the height and x is the weight, and you should find an equation that has y as the left hand side and an expression with x on the right hand side.

(8) To get the equation for $g \circ f(x) = g(f(x))$ start writing g and every time you see x substitute it with $f(x)$.

(9) The difference quotient of the function f is $D(x, h) = \frac{f(x+h)-f(x)}{h}$

(10) Consider the quadratic function $f(x) = ax^2 + bx + c$ and its graph P (for parabola). If $g(x)$ is a function whose graph is P shifted up by k then $g(x) = f(x) + k$. If $h(x)$ is a function whose graph is P shifted j to the right then $h(x) = f(x - k) = a(x - k)^2 + b(x - k) + c$

(11) Rules for exponents:

1	$b^0 = 1$	**6**	$\frac{b^n}{b^m} = b^{n-m}$
2	$b^1 = b$	**7**	$(b^n)^m = b^{nm}$
3	$b^{-n} = \frac{1}{b^n}$	**8**	$b^{\frac{n}{m}} = \sqrt[m]{b^n}$
4	$b^{\frac{1}{n}} = \sqrt[n]{b}$	**9**	$(a \cdot b)^n = a^n \cdot b^n$
5	$b^n \cdot b^m = b^{n+m}$	**10**	$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

(12) Rules for logarithms:

The definition of $\log_b(x)$ is the power that you must raise b by to get x or:

$$b^y = x \Leftrightarrow log_b(x) = y$$

Notice that y is the power. Here are rules for computing logarithms:

1 $\log_b(1) = 0$

2 $\log_b b = 1$

3 $\log_b(b^n) = n$

4 $\log_b(\frac{1}{b^n}) = -n$

5 $\log_b(xy) = \log_b(x) + \log_b(y)$

6 $\log_b(\frac{x}{y}) = \log_b(x) - \log_b(y)$

7 $\log_b(x^t) = t \cdot \log_b(x)$

8 $\log_b(x) = \frac{\log_a(x)}{\log_a(b)}$

(13) Compounded interest:

P = principal

r = periodic rate = $\dfrac{\text{nominal rate}}{\text{periods per year}}$

n = #time periods = (#years) · (#periods per year)

S = compounded amount

$$S = P(1 + r)^n$$

(14) Effective rate is the rate of interest your money earns in a year when the nominal interest rate is s compounded m times a year

$$r_e = \left(1 + \frac{s}{m}\right)^m - 1$$

(15) Amount of Annuities: annuities (payment made at the end of the term):

R = value of payment (at the time of the payment

r = periodic rate

n = number of periods in whole term

$S_{n\urcorner r} = \dfrac{(1+r)^n - 1}{r}$

The amount of an ordinary annuity (where payments are made at the end of the period) is:

$$S = R \cdot S_{n\urcorner r}$$

The amount of an annuity due (payments are made in the beginning of the period) is:

$$S' = R \cdot S_{(n+1)\urcorner r} - R$$

(16) A matrix is a table with numbers. A *leading entry* of a row is the first number from the left that is non-zero.

(17) A matrix is *reduced* if:

- All zero rows are on the bottom.
- Each leading entry of a row is to the right of the leading entries above it.
- Each leading entry is equal to 1 and it is the only non-zero number in its column.