1. Finding the equation of a line.

1. Find two points (x_1, y_1), (x_2, y_2) and compute the slope
$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$
2. The line equation is $y = m(x - x_1) + y_2$ (expand to get in the form $y = mx + b$).

Two examples from old exams:
"The supply function is linear. The supplier is willing to provide 35 items if the price is \$80/item, but only 5 items if the price is \$20/item. Find the supply function."

"The total cost function is linear. The fixed cost is \$3482 and the total cost to produce 20 Trinkets is \$4004. Find the total cost function."

2. Supply-Demand Problems.

1. Market equilibrium is at the quantity and price where supply and demand intersect (you have to combine the equations).
2. If price is above the market equilibrium, then there is a surplus. If price is below, there is a shortage.

Two examples from old exams:
"Find the market equilibrium."

"If the price is \$49/item, is there a surplus or shortfall?"

3. Know Function Definitions and How to Use Functional Notation.

Several examples from old exams:

"If $AVC(q) = 0.01q^2 - 0.5q + 26$ and $FC = 240$, give the formulas for $TC(q)$ and $AC(q)$."

"If price is $p = -16q + 1000$, give the formula for $TR(q)$ and $MR(q)$"

"If $TC(q) = 0.01q^2 + q + 150$, give the formula for $AC(q)$ and $AVC(q)$."

"If $D(t) = 2.4t - 0.016t^2$ give the formula for $ATS(t)$ and $\frac{D(10+h)-D(10)}{h}$.

"If $f(x) = x^2 - 10x + 36$, compute and simplify $\frac{f(8+h)-f(8)}{h}$.

4. Remember the Standard Applications We Have Been Discussing All Term.

1. Maximum profit occurs when $MR = MC$. If the profit function is a quadratic, we can also find the vertex of the profit function.
2. The quantity where profit is zero is call the break even point. That is when $TR = TC$.
3. The break even price (BEP) is the lowest y-value of $y = AC(x)$. It is also the y-value when $AC(x) = MC(x)$.
4. The shutdown price (SDP) is the lowest y-value of $y = AVC(x)$. It is also the y-value when $AVC(x) = MC(x)$.

Several examples from old exams:

"At what quantities do you break even?"

"What selling price leads to the largest possible profit?"

"Compute the shutdown price (SDP)."

5. Know How to Find and Interpret the Vertex of a Parabola.

1. The vertex of the parabola $y = ax^2 + bx + c$ occurs at $x = -\frac{b}{(2a)}$. If $a > 0$, then the vertex gives a minimum value and if $a < 0$, then the vertex gives a maximum value.
2. Read the question carefully. Is it asking for the x-coordinate of the vertex? Is it asking for the value of the function at the vertex? Is it asking for some other quantity relating the vertex?

Several examples from old exams:

"What is the largest possible total revenue?"

"If $AVC(q) = 0.01q^2 - 0.5q + 26$, what is shutdown price (SDP)?"

"Determine the longest range of quantities on which profit increases."

"Find the longest range of quantities over which the total revenue increases, but the profit decreases."

6. Know How to Solve Equations involving Quadratics.

1. If you have a quadratic equation to solve (the only variable is x), then get one side to zero and you end up with $ax^2 + bx + c = 0$. The solutions to this equation are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{(2a)}$$

Several examples from old exams:

"Find when $AVC(q) = 0.01q^2 - 0.5q + 26$ is equal to 28."

"If $TR(q) = -0.5q^2 + 6q$, then find the range of quantities over which total revenue is at least 12 hundred dollars."

"For what quantities if profit exactly \$3000."

7. **Be able to Solve a System of Equations**.

1. Solve for one variable in one of the equations.
2. Substitute into the other equation. Simplify and solve for the one remaining variable.
3. Go back and get the other variable.

Several examples from old exams:

You have to do this in every linear programming example (there is one on every exam).

You have to do this in every supply/demand problem where you are asked to find the market equilibrium (also on many old exams).

8. **Know How to Do Linear Programming**.

1. Give constraints and graph overlapping feasible region.
2. Find the corners that are touching the feasible region.
3. Evaluate the objective at these corner.

Several examples from old exams:

You'll find an example in every old second midterm and most of the old finals. You will see this on our second midterm!

9. Know the Basics of Working with Exponentials and Logarithms.

1. Be able to solve equations as we have been discussing in class.
2. In particular be able to solve equations that involve e^x in some way.

Several examples from old exams:

"Solve $14400 = 12000e^{3r}$ for r."

"Solve $200000 = 350000(1 - e^{-0.07t})$ for t."