1. One teaspoon of vanilla. It's an essential ingredient in hundreds of recipes, from cookies and cakes to ice cream and cream soda... But a quick glance at the price tag on that bottle in any grocery store, and it might seem that the rich and creamy liquid is almost too precious to pour out.... In 2000, a 4-ounce bottle of pure vanilla extract cost consumers about $5. They now pay $15.

The high prices are changing the American pallet. Between 2000 and 2003, Americans began to buy much more imitation vanilla, ... The change has logically reshaped the character and caliber of certain baked goods and other snacks, say experts.

Madagascar, an island off Africa's southeast coast, produces about 70 percent of the world's vanilla crop. Two unexpected events there - one political the other environmental - prompted vanilla's global price spike.

The first hit in 1994, when the International Monetary Fund required Madagascar to abandon price controls restricting the amount of vanilla its farmers could sell to buyers.... Soon after, the nation's vanilla reserves, which had numbered about 2,000 tons annually, were sold out.

The second surprise: A massive cyclone that ripped through Madagascar in the spring of 2000, destroying an estimated 25 percent of the nation's vanilla crop and more than 100 tons of inventory waiting for export.

"Typically [foodmakers] would prefer to use a vanilla of a lower quality and cost rather than pass price increases on to consumers," adds Rick Brownell, vice president of vanilla products for Virginia Dare, a flavor manufacturer in New York City. The company estimates worldwide demand for pure vanilla has declined 35 percent over the last two to three years.

But some food manufacturers are reluctant to switch. Virginia Dare has one client that it describes as a "super-premium" ice cream maker which will not downgrade vanilla because it believes their customers will notice.

Instead, producers like these, and the spice and flavor industries at large, have been searching for new ways to grow vanilla. But geography has hindered their efforts. The cultivation of vanilla beans, which grow from several species of orchids, is restricted to tropical climates within 20 degrees of the equator, with average humidity above 80 percent.

One obstacle is disease, which plagues vanilla more than almost any other spice in the world. "Whatever you think is pretty and good to eat, a virus or a bug wants to get in and eat too," says James Reddekopp, on Hawaii's main island....

An added burden is the old-world techniques required for harvest the bean. The flower on each vine blooms for only four hours each year, at which point it must be hand pollinated. (At the Hawaiian Vanilla Co., one woman is responsible for pollinating about 800 blossoms each day during the spring.)

But the vanilla industry's ultimate spoiler is weather. The humid tropical climate necessary to grow vanilla also exposes the crop to more incidents of extreme weather....

Does the article suggest that the demand for vanilla is elastic or inelastic? Is this what expect? Why or why not?
Must use numbers for partial credit. Prices went up about 300% from 5 to 15 and the quantity demanded fell by 35%. This appears relatively inelastic.
If you said elastic, you must say because there are substitute.
If you said inelastic, small part of people’s budget if they only use a teaspoon full for each recipe or no substitutes
The author of the article cites two unexpected events that led to the increase in the price of vanilla. Critique the author’s analysis of these two events. In particular, would we expect these events to cause the price of vanilla to increase? If yes, why? If no, why not? Please support your answers using supply and demand diagrams and a complete description of any change in supply, demand, quantity supplied, quantity demanded and the equilibrium.

<table>
<thead>
<tr>
<th>The first hit in 1994, when the International Monetary Fund required Madagascar to abandon price controls restricting the amount of vanilla its farmers could sell to buyers….Soon after, the nation's vanilla reserves, which had numbered about 2,000 tons annually, were sold out.</th>
<th>The second surprise: A massive cyclone that ripped through Madagascar in the spring of 2000, destroying an estimated 25 percent of the nation's vanilla crop and more than 100 tons of inventory waiting for export….</th>
</tr>
</thead>
<tbody>
<tr>
<td>This one should have LOWERED the price NOT raised the price as price controls that kept supplies low were eliminated.</td>
<td>This one should have increased the price. A slower supply implies a higher price.</td>
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For the price supports: either…

- P decreased and Q\(D\) increased.

For the weather, must have said:

- S decreased and P increased, Q* decreased Q\(D\) decreased/
2. (10 points) Scott collects pens with floating object in them. The following graph represents Scott’s budget constraints (BC) and indifference curves (I) for pens with floating objects and all other goods, Y. The points labeled R, S and T are the consumption points Scott chooses when facing each budget constraint.

a. If point R shows Scott’s consumption choice when he is on BC0, what is the marginal rate of substitution at this point? Explain how you know and verbally interpret this number.

If Scott chooses point R, it is because the benefit of one more Pen (MRS) is equal to the cost of one more Pen \(\left(\frac{P_{\text{pen}}}{P_Y}\right)\). In this case, the price ratio is 2, therefore, the MRS is also 2. This is the amount of Y Scott is willing to give up to get one more Pen.

b. Circle the correct choice: Assuming that income does not change, when Scott moved from BC0 to BC1 the price of Pens with Floating Objects \(\text{(increased, decreased, stayed the same)}\) and the price of Y \(\text{(increased, decreased, stayed the same)}\).

c. Carefully graph the total, income, and substitution effects between points R and S. Label everything.

d. Between points R and S, are Pens with Floating Objects normal or inferior goods? Explain. The income effect determines whether the good is normal or inferior. In this case, when Scott feels poorer (the between the hypothetical budget constraint(BCH) and the new budget constraint (BC1), he consumes more Pens. Therefore, Pens are inferior.

e. Between points R and S, are Pens with Floating Objects and Y complements or substitutes? Explain. When the price of Pens increases, Scott buys less Y (from 160 to ~135) so they are complements.
f. Scott’s income is $400. Show 3 points on Scott’s demand curve for Pens with Floating Objects. Label your axes.

At point R Scott consumes ~20 pens and the price of pens is $4, because if he spends all his M, income, on pens he can buy 100 (see the endpoint of BC0, which is $\frac{M}{P_y} = 400 \div 400 = 100$).

At point S Scott consumes ≈ 14 pens and the price of pens is $10, because if he spends all his M on pens he can buy 40 (see the endpoint of BC1).

At point T Scott consumes ≈ 7 pens and the price of pens is $20, because if he spends all his M on pens he can buy 20 (see the endpoint of BC1).
3. (10 points) Sandy, Diane and Laurie are the only 3 consumers in Smalltown, USA’s babysitting market. Sandy’s demand curve is \( P = 100 - q_s \). Diane’s demand curve is \( P = 50 - \frac{1}{2}q_d \) and Laurie’s demand curve is \( P = 50 - \frac{1}{2}q_l \).

a. Write the algebraic expression(s) for the market demand curve for babysitters.

Sandy is the only one in the market when the price is above $50. When the price falls below $50, Laurie and Diane enter the market. To find the market demand at a price below $50:

\[
\begin{array}{|c|c|c|}
\hline
& \text{Sandy} & \text{Diane} & \text{Laurie} \\
\hline
\text{Step 1: Solve for } q & P = 100 - q_s & P = 50 - \frac{1}{2}q_d & P = 50 - \frac{1}{2}q_l \\
q_s = 100 - P & \frac{1}{2}q_d = 50 - P & \frac{1}{2}q_l = 50 - P \\
& q_d = 100 - 2P & q_l = 100 - 2P \\
\hline
\text{Step 2: Add } q_s \text{ to get } Q & Q^d_{\text{Market}} = q_s + q_d + q_l = 100 - P + 100 - 2P + 100 - 2P = 300 - 5P \\
\hline
\text{Step 3: Solve for } P & Q^d_{\text{Market}} = 300 - 5P \\
& P = 60 - \frac{1}{5}Q^d_{\text{Market}} \\
\hline
\end{array}
\]

The complete answer is:

\( P \geq 50: \quad P = 100 - Q^d_{\text{Market}} \)

\( P < 50: \quad P = 60 - \frac{1}{5}Q^d_{\text{Market}} \)
b. The following diagram shows the market supply curve for babysitters. Graphically OR algebraically calculate the market equilibrium price and quantity.

![Market Supply Curve Diagram]

Demand: \( P = 60 - \frac{1}{5}Q_d \) \( ; \) Supply: \( P = \frac{1}{5}Q_s \)

Set demand equal to supply:
\[
60 - \frac{1}{5}Q = \frac{1}{5}Q
\]

\[
60 = \frac{2}{5}Q
\]

\( Q = 150 \)

\( P = \frac{1}{5}(150) = $30 \)

c. BRIEFLY explain the intended and unintended consequences in this market if the mayor of Smalltown puts a price ceiling of $10/hour on the hourly wages (price) that babysitter’s can be paid.

**Intended:** make babysitters more affordable for consumers

**Unintended:** create shortage \( (Q^d > Q^s) \). Maybe lower the quality of babysitters because quantity supplied shrinks. Maybe create a black market where some people illegally pay the babysitters more than the ceiling.
4. (10 points) Mr. Stress leads a very busy life. He gets satisfaction out of two services: massages and yoga. In his opinion, 3 yoga classes give him as much satisfaction as 2 massages, no matter how many of each he has. Mr. Stress has $1000/year to spend on massages and yoga classes. The cost of a massage is $10/massage and the cost of a yoga class is $10/class.

a. Graphically illustrate Mr. Stress’ optimal consumption point (A) with a budget constraint (labeled BC0) and an indifference curve (IC0) diagram.

b. At Mr. Stress’s optimal consumption point, is the benefit of 1 more yoga class in terms of massages equal to the cost of one more yoga class in terms of massages? Why or why not?

The benefit is her MRS or the absolute value of the slope of her indifference curve: \[ \frac{2}{3} \]

The cost is the absolute value of the slope of her budget constraint or \[ \frac{P_Y}{P_M} = \frac{10}{10} = 1 \]

The cost is always greater than the benefit, which is why he doesn’t consume any yoga classes (corner solution).

c. The massage therapist decides to offer the following deal: After receiving 50 massages at the regular price of $10/message, each additional massage is only $4/message. Graphically illustrate any change this has in Mr. Stress’ decision. Verbally explain your answer.

After she buys 50 massages at a total cost of $50*10 = $500, she can get 125 more with her remaining $500 ($500/$4 = 125). This allows her to get a total of 50+125 or 175 massages. The price of massages changes AFTER he buys 50 massages, so the slope of the budget constraint also changes. With this new BC1, he will still buy all massages, but she will now buy 175 instead of 100 (point B).
5. Please answer the following TWO questions true, false or uncertain and completely explain your answer. Graphs may help your explanation.

a. (5 points) Economic theory and the design of the food stamp program in the United States suggest that many persons should prefer cash to food stamps. 

The food stamp program in the US only allows persons to buy food that is not for immediate consumption, so it is an in-kind/targeted transfer. Theory suggests that this kind of transfer will cause people who have preferences for little food and would otherwise spend less than the food stamp amount on food, to spend their entire food stamp income on food, when they might prefer cash so that they could spend some of the $ on food and some on other things. See HW 4 Answer key (diagram copied below). However, the dollar amount of food stamps provided to individuals is not large in the US system so there is no reason to think that many people would prefer cash. The Whitmore study found that ~20% of individuals are spending less than their food stamp value on food, which suggests these 20% prefer cash.

![Diagram showing food stamp preference]

2. (5 points) The following Hicksian (compensated) and Marshallian (uncompensated) demand curves for good X indicate that good X is an inferior good.

\[ P = \frac{\$}{Q} \]

True. The Marshallian demand curve is the sum of the substitution and income effects. The Hicksian demand is the substitution effect only. When the price decreases, the quantity increase more as a result of the substitution effect alone (Hicksian demand) than as a result of the sum of the substitution and income effects. This implies that the income effect works opposite of the substitution effect and, therefore the product is an inferior good.
6. (10 points) Lila Hypoc consumes two commodities, health care, H, and all other goods, Y. Lila’s income is M, the price of H is \( P_H \) and the price of Y is \( P_Y \).

a. Sketch Lila’s budget constraint, labeling everything carefully!

b. Suppose the government announces that it will provide \( H^* \) units of health care to Lila for free \( (P_H = 0) \). \( H^* \) is an amount below the maximum amount of H Lila could buy if she spent all her income on health care. However, enrollment in the government program precludes the purchase of health care from private practitioners. That is, consumers who \textbf{CHOOSE} the government program, cannot buy more than the government provided \( H^* \) units of health care. Sketch the budget constraint associated with this program.

c. Assuming Lila has typical, convex shaped indifference curves, graphically show how it is possible that the government’s provision of “free” health care may lead to a decrease in the consumption of health care. BRIEFLY explain your response.

\textit{Lila can reach a higher indifference curve (that is, a higher level of satisfaction) by consuming \( H^* \) rather than \( H_0 \), therefore, she will choose the free health care and consume much more \( Y \) than she was consuming before.}