HE1002 Macroeconomics I

Final Practice Examination 2 – Solutions

Academic Year 2025/2026, Semester 1

Quantitative Research Society @NTU

November 14, 2025

Question 1: Calculations – Complete Solutions (30 marks)

1.1 *[Source: T01-Q02]* – Value-Added Method (2 marks)

Given: Farmer sells wheat \$100, Miller sells flour \$300, Baker sells bread \$600.

Formula:

$$\text{GDP} = \sum \text{Value Added at each stage}$$

Solution:

$$\begin{aligned}
\text{Farmer's value added} &= 100 - 0 = 100 \\
\text{Miller's value added} &= 300 - 100 = 200 \\
\text{Baker's value added} &= 600 - 300 = 300 \\
\text{Total GDP} &= 100 + 200 + 300 = \boxed{\$600}
\end{aligned}$$

Note: Value-added method avoids double-counting by only counting the value added at each stage, not the total sales.

1.2 *[Source: T01-Q09]* – GDP Calculation (2 marks)

Given: $C = 8{,}000$, $I = 2{,}500$, $G = 1{,}800$, $X = 900$, $M = 1{,}200$.

Formula:

$$\text{GDP} = C + I + G + (X - M)$$

Solution:

$$\begin{aligned}
NX &= 900 - 1{,}200 = -300 \\
\text{GDP} &= 8{,}000 + 2{,}500 + 1{,}800 + (-300) \\
&= \boxed{\$12{,}000}
\end{aligned}$$

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1.3 *[Source: T02-Q04]* – Inflation Rate (2 marks)

Given: $\text{Cost}_{2023} = \$180$, $\text{Cost}_{2024} = \$198$, Base CPI = 100.

Formulas:

$$\text{CPI}_{2024} = \frac{\text{Cost}_{2024}}{\text{Cost}_{2023}} \times 100$$
$$\pi = \frac{\text{CPI}_{2024} - 100}{100} \times 100\%$$

Solution:

$$\text{CPI}_{2024} = \frac{198}{180} \times 100 = 110$$
$$\pi = \frac{110 - 100}{100} \times 100\% = \boxed{10\%}$$

1.4 *[Source: T02-Q07]* – Real Interest Rate (2 marks)

Given: Nominal rate $i = 6\%$, Inflation $\pi = 2\%$.

Formula (Fisher Equation):

$$r \approx i - \pi$$

Solution:

$$r = 6\% - 2\% = \boxed{4\%}$$

1.5 *[Source: T03-Q03]* – Labor Market Statistics (2 marks)

Given: WAP = 85,000, LF = 42,500, Employed = 40,250.

Formulas:

$$\text{Unemployed} = \text{LF} - \text{Employed}$$
$$u = \frac{\text{Unemployed}}{\text{LF}} \times 100\%$$
$$\text{LFPR} = \frac{\text{LF}}{\text{WAP}} \times 100\%$$

Solution:

Unemployed: $42{,}500 - 40{,}250 = 2{,}250$

(a) Unemployment rate:

$$u = \frac{2{,}250}{42{,}500} \times 100\% = \boxed{5.29\%}$$

(b) Labor force participation rate:

$$\text{LFPR} = \frac{42{,}500}{85{,}000} \times 100\% = \boxed{50.0\%}$$

Unofficial Solutions by QRS@NTU

1.6 *[Source: T04-Q02]* – Real GDP Per Capita Growth (2 marks)

Given: $g_{\text{Nom}} = 10\%$, $\pi = 4\%$, $g_{\text{Pop}} = 1.5\%$.

Formula:

$$g_{\text{GDP/cap}} \approx g_{\text{Nominal}} - \pi - g_{\text{Pop}}$$

Solution:

$$g_{\text{GDP/cap}} = 10\% - 4\% - 1.5\% = \boxed{4.5\%}$$

1.7 *[Source: T04-Q09]* – Growth Accounting (2 marks)

Given: $g_Y = 5\%$, $g_K = 3\%$, $g_L = 2\%$, $\alpha = 0.35$.

Formula:

$$g_A = g_Y - \alpha g_K - (1-\alpha) g_L$$

Solution:

$$\begin{aligned} g_A &= 5 - 0.35(3) - 0.65(2) \\ &= 5 - 1.05 - 1.30 \\ &= \boxed{2.65\%} \end{aligned}$$

Interpretation: TFP contributes 2.65 percentage points to the 5% total growth (53%).

1.8 *[Source: T05-Q06]* – Equilibrium Output (2 marks)

Given: $C = 500 + 0.8(Y - T)$, $I = 800$, $G = 400$, $T = 300$, $NX = 100$.

Formula:

$$Y = C + I + G + NX$$

Solution:

At equilibrium:

$$\begin{aligned} Y &= 500 + 0.8(Y - 300) + 800 + 400 + 100 \\ Y &= 500 + 0.8Y - 240 + 1{,}300 \\ Y &= 1{,}560 + 0.8Y \\ 0.2Y &= 1{,}560 \\ Y^* &= \boxed{\$7{,}800} \end{aligned}$$

Unofficial Lesson Plan Materials

1.9 *[Source: T05-Q16]* – Closing Output Gap (2 marks)

Given: MPC = 0.75, Recessionary gap = \$400B.

Formulas:

$$m = \frac{1}{1 - \text{MPC}}$$
$$\Delta G = \frac{\text{Gap}}{m}$$

Solution:

$$m = \frac{1}{1 - 0.75} = 4$$
$$\Delta G = \frac{400}{4} = \boxed{\text{\$100 billion}}$$

1.10 *[Source: T06-Q13]* – Nominal GDP Growth (2 marks)

Given: $g_P = 5\%$, $g_Y = 3\%$.

Formula:

$$g_{\text{Nominal}} \approx g_P + g_Y$$

Solution:

$$g_{\text{Nominal}} = 5\% + 3\% = \boxed{8\%}$$

1.11 *[Source: T07-Q07]* – Government Spending Requirement (2 marks)

Given: MPC = 0.80, Desired ΔY = \$500B.

Formulas:

$$m_G = \frac{1}{1 - \text{MPC}}$$
$$\Delta G = \frac{\Delta Y}{m_G}$$

Solution:

$$m_G = \frac{1}{1 - 0.80} = 5$$
$$\Delta G = \frac{500}{5} = \boxed{\text{\$100 billion}}$$

Unofficial QRS@NTU Solutions

1.12 *[Source: T08-Q08]* – Loanable Funds Equilibrium (2 marks)

Given: $S = 200 + 10r$, $I = 500 - 20r$.

Equilibrium Condition:

$$S(r^*) = I(r^*)$$

Solution:

$$\begin{aligned} 200 + 10r &= 500 - 20r \\ 30r &= 300 \\ r^* &= \boxed{10\%} \end{aligned}$$

Equilibrium quantity:

$$Q^* = 200 + 10(10) = \boxed{300}$$

1.13 *[Source: T09-Q08]* – Money Multiplier (2 marks)

Given: Reserve ratio = 0.20, Initial deposit = \$5,000.

Formula:

$$m_{\text{money}} = \frac{1}{\text{RR}}$$
$$\text{Total Money} = m \times \text{Deposit}$$

Solution:

$$m = \frac{1}{0.20} = 5$$
$$\text{Total} = 5 \times 5{,}000 = \boxed{\$25{,}000}$$

1.14 *[Source: T10-Q21]* – Phillips Curve (2 marks)

Given: $\pi = 3\% - 0.5(u - 5\%)$, $u = 4\%$.

Formula: Phillips Curve equation.

Solution:

$$\begin{aligned} \pi &= 3\% - 0.5(4\% - 5\%) \\ &= 3\% - 0.5(-1\%) \\ &= 3\% + 0.5\% \\ &= \boxed{3.5\%} \end{aligned}$$

Interpretation: Unemployment below natural rate (4% ¡ 5%) creates upward wage pressure, pushing inflation above expected.

1.15 *[Source: T12-Q02]* – Open Economy Accounts (2 marks)

Given: $Y = 20{,}000$, $C = 12{,}000$, $G = 4{,}000$, $I = 3{,}000$, $T = 3{,}500$.

Formulas:

$$Y = C + I + G + NX$$
$$NCO = NX \quad \text{(identity)}$$

Solution:

(a) Net exports:

$$20{,}000 = 12{,}000 + 3{,}000 + 4{,}000 + NX$$
$$NX = \boxed{\$1{,}000\text{B}}$$

(b) Net capital outflow:

$$NCO = NX = \boxed{\$1{,}000\text{B}}$$

Result: Trade surplus and capital outflows of \$1,000B.

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Question 2: Short Answer – Complete Solutions (30 marks)

2.1 *[Source: T01-Q01]* – Value-Added Method (3 marks)

Answer:

The value-added method calculates GDP by summing the value added at each stage of production. Value added equals the difference between a firm's revenue and the cost of intermediate inputs purchased from other firms. This method avoids double-counting because it only counts the new value created at each production stage, not the total sales value. For example, if a miller buys \$100 wheat and sells \$300 flour, only the \$200 value added (\$300 - \$100) counts toward GDP, not the full \$300 sale.

2.2 *[Source: T02-Q06]* – CPI Overstatement (3 marks)

Answer:

The CPI tends to overstate inflation due to three main biases: (1) **Substitution bias**—consumers switch to cheaper alternatives when prices rise, but CPI uses fixed basket; (2) **New goods bias**—new products improve variety and quality but aren't immediately incorporated into CPI; (3) **Quality change bias**—products improve over time, but CPI doesn't fully account for quality improvements. These biases cause CPI to overstate true cost-of-living increases by approximately 0.5-1 percentage point annually.

2.3 *[Source: T03-Q10]* – Unemployment Insurance Trade-offs (3 marks)

Answer:

Unemployment insurance (UI) tends to increase unemployment duration because it reduces the opportunity cost of remaining unemployed. Workers receiving benefits have less financial pressure to accept the first available job, allowing them to search longer for better matches. However, this creates a policy trade-off: generous UI provides valuable income security and improves job matching quality, but it also creates moral hazard by reducing search intensity and extending unemployment spells. Policymakers must balance these competing considerations when designing UI programs.

2.4 *[Source: T04-Q05]* – Human Capital (3 marks)

Answer:

Human capital—the knowledge, skills, and capabilities embodied in workers—is crucial for economic growth because it increases labor productivity and enables technological adoption. Better-educated workers can use existing capital more effectively, adapt to new

technologies faster, and innovate more readily. Example: A country that invests in universal secondary education will see higher productivity as workers can read technical manuals, operate complex machinery, and problem-solve more effectively, directly increasing output per worker and enabling sustained economic growth.

2.5 *[Source: T05-Q11]* – Actual vs Theoretical Multiplier (3 marks)

Answer:

The actual expenditure multiplier is smaller than the theoretical $1/(1 - MPC)$ for several reasons: (1) Some spending "leaks out" to imports rather than domestic production; (2) Higher output may trigger inflation, reducing real purchasing power; (3) Interest rates may rise as income increases, reducing investment (crowding out); (4) Taxes increase automatically with income through progressive tax system; (5) Expectations about future policy may cause consumers to save rather than spend. These factors reduce the multiplier from theoretical values of 4-5 to actual values often around 1.5-2.

2.6 *[Source: T06-Q10]* – SRAS Shifts (3 marks)

Answer:

The short-run aggregate supply (SRAS) curve shifts when production costs or price expectations change. Examples: (1) **Input price changes**—higher oil prices increase production costs, shifting SRAS left (reduced output at each price level); (2) **Expected price level changes**—if firms expect higher future prices, they reduce current supply, shifting SRAS left; (3) **Wage changes**—negotiated wage increases raise labor costs, shifting SRAS left. Other factors include changes in productivity, business taxes, or supply shocks like natural disasters.

2.7 *[Source: T07-Q03]* – Deficit and Interest Rates (3 marks)

Answer:

A government budget deficit (spending exceeds taxes) increases demand for loanable funds because the government must borrow to finance the deficit. This increased demand shifts the demand curve right in the loanable funds market, raising the equilibrium interest rate. Higher interest rates reduce private investment by making borrowing more expensive for businesses, a phenomenon called "crowding out." The net effect is that government borrowing partially displaces private investment, reducing the fiscal policy's effectiveness in stimulating total spending.

2.8 *[Source: T08-Q02]* – FDI vs FPI (3 marks)

Answer:

Foreign Direct Investment (FDI) involves acquiring a controlling stake (typically $\geq$ 10% ownership) in a foreign business, such as building factories abroad or acquiring foreign companies. FDI implies active management and long-term commitment. **Foreign Portfolio Investment (FPI)** involves purchasing foreign financial assets (stocks, bonds) without controlling interest, seeking financial returns without management involvement. FPI is more liquid and easily reversible, while FDI represents more stable, long-term capital flows with technology transfer potential.

2.9 *[Source: T09-Q04]* – Open Market Operations (3 marks)

Answer:

Open market operations (OMOs) are the Federal Reserve's primary monetary policy tool. When the Fed **buys** government securities from banks, it injects reserves into the banking system, increasing banks' lending capacity and expanding the money supply through the money multiplier. When the Fed **sells** securities, it removes reserves, contracting the money supply. OMOs are flexible, precise, and easily reversible, making them the preferred tool for day-to-day monetary policy implementation compared to discount rate changes or reserve requirement adjustments.

2.10 *[Source: T10-Q06]* – NAIRU (3 marks)

Answer:

The natural rate of unemployment (NAIRU - Non-Accelerating Inflation Rate of Unemployment) is the unemployment rate when the economy is at full employment, consisting of frictional and structural unemployment only. Unemployment cannot fall below NAIRU permanently because attempting to do so creates wage pressure as labor markets tighten, causing accelerating inflation. This reflects the long-run vertical Phillips curve: there's no permanent trade-off between unemployment and inflation. Any temporary reduction below NAIRU eventually causes rising inflation expectations, forcing unemployment back to the natural rate.

Question 3: True or False – Complete Solutions (30 marks)

3.1 *[Source: T01-Q08]* – Housing Investment (3 marks)

Statement: If you purchase a newly constructed house, it counts as investment in GDP, not consumption.

Answer: **TRUE**

Explanation: In national income accounting, purchases of new residential structures count as **investment**, specifically residential fixed investment, not consumption. This is because housing provides a flow of services over many years (like capital equipment), unlike typical consumption goods that are used up quickly. However, if you purchase an *existing* house, it doesn't count toward current GDP at all (only the realtor's commission counts) because the house was already produced and counted in a previous year's GDP.

3.2 *[Source: T02-Q09]* – Real Wage Growth (3 marks)

Statement: If your nominal wage increases by 5% and inflation is 3%, your real wage has increased by approximately 2%.

Answer: **TRUE**

Explanation: The real wage measures purchasing power after adjusting for inflation. Using the approximation formula: $g_{\text{real wage}} \approx g_{\text{nominal wage}} - \pi = 5\% - 3\% = 2\%$. This means that although your nominal wage increased by 5%, prices also rose by 3%, so your actual purchasing power increased by only 2%. You can buy roughly 2% more goods and services than before. The exact formula is $(1.05/1.03) - 1 \approx 1.94\%$, confirming the approximation is accurate.

3.3 *[Source: T03-Q09]* – UI and Natural Rate (3 marks)

Statement: Generous unemployment benefits increase the natural rate of unemployment.

Answer: **TRUE**

Explanation: Generous unemployment insurance increases the natural rate through two mechanisms: (1) Reduces job search intensity—workers with comfortable benefits search less aggressively for employment; (2) Increases reservation wage—workers reject lower-paying jobs because UI provides acceptable income. Both effects increase frictional unemployment duration. Since the natural rate includes frictional unemployment, more generous benefits raise u_n. Empirical evidence shows unemployment duration spikes when benefits are about to expire, confirming that benefit generosity affects search behavior.

3.4 *[Source: T04-Q10]* – Saving and Growth (3 marks)

Statement: Countries with higher saving rates always have higher economic growth rates.

Answer: **FALSE**

Explanation: While higher saving enables more investment and capital accumulation, it doesn't guarantee higher growth. The relationship is subject to diminishing returns—additional capital has decreasing impact on output. Furthermore, growth depends critically on other factors: technological progress (TFP), human capital quality, institutional quality, and efficient resource allocation. A country with high saving but poor institutions, corruption, or misallocated investment may grow slowly. Example: Some developing countries have high saving rates but low growth due to inefficient investment, while technology-driven economies grow rapidly despite modest saving rates.

3.5 *[Source: T05-Q08]* – Consumer Confidence (3 marks)

Statement: An increase in consumer confidence shifts the consumption function upward, increasing output in the short run.

Answer: **TRUE**

Explanation: Higher consumer confidence increases autonomous consumption (C_0) as consumers feel more optimistic about future income and job security, shifting the consumption function from $C = C_0 + MPC(Y - T)$ to $C = C_0' + MPC(Y - T)$ where $C_0' > C_0$. This increases planned aggregate expenditure at every income level, shifting the PAE curve upward. Through the multiplier process, equilibrium output increases: $\Delta Y = m \times \Delta C_0$. This explains why consumer confidence indices are important leading indicators of economic activity.

3.6 *[Source: T06-Q15]* – Supply Shock Effects (3 marks)

Statement: A negative supply shock (such as an oil price increase) shifts both the short-run and long-run aggregate supply curves to the left.

Answer: **FALSE**

Explanation: A negative supply shock like higher oil prices shifts the **SRAS curve left** (higher production costs at each price level) but typically does *not* shift the LRAS curve, which depends on fundamental productive capacity (technology, capital stock, labor force, natural resources). Temporary oil price increases don't reduce the economy's long-run production potential. However, if the shock is permanent and severe (e.g., permanent loss of natural resources), it could shift LRAS left. Most supply shocks (weather, temporary commodity prices) affect only SRAS.

3.7 *[Source: T07-Q12]* – Balanced Budget Multiplier (3 marks)

Statement: If the government increases spending and taxes by the same amount, aggregate demand will increase.

Answer: **TRUE**

Explanation: This is the **balanced budget multiplier theorem**. Government spending has multiplier $m_G = 1/(1 - MPC) = 4$, while taxes have multiplier $m_T = -MPC/(1 -$

$MPC) = -3$ (assuming MPC = 0.75). A \$100B increase in both G and T yields: $\Delta Y = 4(100) + (-3)(100) = 400 - 300 = +100$B. Net effect is +\$100B because government spending directly enters AD, while taxes only indirectly reduce AD through consumption. The balanced budget multiplier equals 1: equal increases in G and T increase Y by the same amount.

3.8 *[Source: T08-Q12]* – Opportunity Cost of Money (3 marks)

Statement: Higher interest rates increase the opportunity cost of holding money.

Answer: **TRUE**

Explanation: Money (cash and checking accounts) typically earns zero or minimal interest. When interest rates rise, holding money becomes more costly because you forgo higher returns available from interest-bearing assets like bonds or savings accounts. For example, if bond rates rise from 2% to 5%, holding \$10,000 in cash means sacrificing \$500 annual interest instead of \$200. This higher opportunity cost reduces money demand—people hold less cash and more interest-bearing assets. This relationship explains the downward-sloping money demand curve.

3.9 *[Source: T10-Q09]* – Fighting Inflation (3 marks)

Statement: If the central bank wants to reduce inflation, it should decrease the money supply, which will increase interest rates and reduce aggregate demand.

Answer: **TRUE**

Explanation: Contractionary monetary policy reduces inflation through the transmission mechanism: Fed reduces money supply $\rightarrow$ interest rates rise $\rightarrow$ investment and consumption decrease $\rightarrow$ aggregate demand shifts left $\rightarrow$ lower output and prices. Higher interest rates make borrowing expensive, reducing business investment and consumer durables purchases. Lower AD reduces inflation pressure, though at the cost of temporarily higher unemployment. This is standard anti-inflation policy, though it creates a short-run Phillips curve trade-off between inflation reduction and employment.

3.10 *[Source: T12-Q15]* – Monetary Policy Under Exchange Regimes (3 marks)

Statement: Under a floating exchange rate, expansionary monetary policy is more effective than under a fixed exchange rate.

Answer: **TRUE**

Explanation: Under **floating** exchange rates, expansionary monetary policy works through two channels: lower interest rates stimulate investment, and currency depreciation boosts net exports—both increase AD. Under **fixed** exchange rates, the central bank cannot independently control money supply because it must maintain the peg. Any monetary expansion causes capital outflows and depreciation pressure, forcing the bank to contract

money supply to defend the fixed rate, neutralizing the policy. Thus, monetary policy is effective under floating but impotent under fixed exchange rates.

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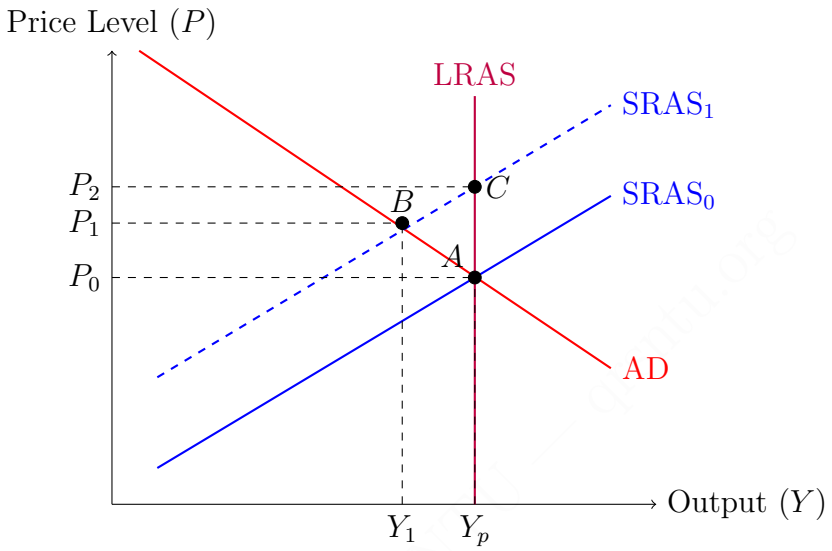
Question 4: Diagrams – Complete Solutions (10 marks)

4.1 *[Source: T06-Q19]* – Stagflation Analysis (5 marks)

Scenario: Economy in long-run equilibrium. World oil prices triple (negative supply shock).

Solution:



Analysis:

(a-b) **Initial equilibrium at point A**: Economy at potential output Y_p, price level P_0. Oil price shock increases production costs, shifting SRAS left from SRAS_0 to SRAS_1.

(c) **Short-run effects (point B)**:

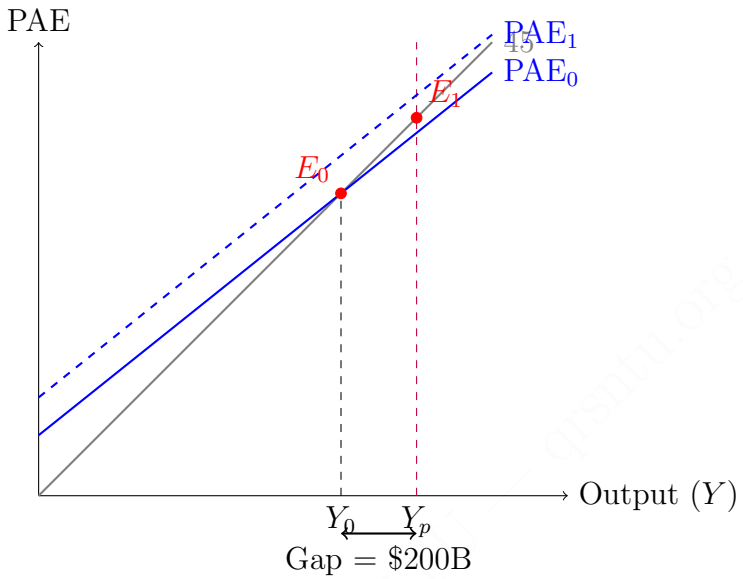
- Output falls from Y_p to Y_1 (recession)
- Price level rises from P_0 to P_1 (inflation)
- Unemployment increases (above natural rate)
- **Stagflation**: simultaneous recession and inflation

(d) **Long-run self-correction**: With high unemployment at point B, wages eventually fall. Lower wages reduce costs, gradually shifting SRAS right. Economy moves from B toward C, approaching point C at original output Y_p but higher price level P_2. Adjustment is slow and painful—high unemployment must persist long enough to force wage reductions. This explains why supply shocks create difficult policy dilemmas with no easy solutions.

4.2 *[Source: T05-Q14]* – Keynesian Cross and Fiscal Policy (5 marks)

Scenario: Recessionary gap \$200B, MPC = 0.75.

Solution:



Analysis:

(a) **Initial situation**: Economy at E_0 with output $Y_0 = \$4{,}800\text{B}$, below potential $Y_p = \$5{,}000\text{B}$. Recessionary gap = \$200B. PAE intersects 45° line at E_0.

(b) **Required government spending increase**:

Formula:

$$m = \frac{1}{1 - \text{MPC}} = \frac{1}{1 - 0.75} = 4$$

$$\Delta G = \frac{\text{Gap}}{m} = \frac{200}{4} = \boxed{\$50\text{B}}$$

(c) **Diagram shift**: \$50B government spending increase shifts PAE upward by \$50B (parallel shift from PAE_0 to PAE_1), moving equilibrium from E_0 to E_1 at potential output.

(d) **Multiplier process**: Initial \$50B spending creates \$50B income. Recipients spend $0.75 \times 50 = 37.5\text{B}$ (first round). This creates more income, leading to second round: $0.75 \times 37.5 = 28.1\text{B}$. Process continues: $50 + 37.5 + 28.1 + \ldots = 50/(1 - 0.75) = 200\text{B}$ total increase. Each dollar of government spending generates \$4 in total output through successive spending rounds.

END OF SOLUTIONS

All solutions reference original tutorial questions
Complete working shown for all calculations

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