

2016

A1. (a) $x - \frac{x^2}{2} + \frac{x^3}{3} - \dots + (-1)^{n+1} \frac{x^n}{n}$; (b) $3.001\dot{6}$; (c) Based on the 2nd order term, 5×10^{-7} .

2. (a) $24/35$; (b) $B = 3, C = 5$; (c) $\frac{3}{2} \ln(2x - 3) + \frac{5}{2} \ln(2x + 1) + c$.

3. (a) concave; (b)(i) convex; (ii) neither.

4. (a) $\begin{pmatrix} 1 - C' & -I' \\ M_Y^D & M_r^D \end{pmatrix} \begin{pmatrix} dY \\ dr \end{pmatrix} = \begin{pmatrix} dG \\ dM \end{pmatrix}$; (b) $dY = (M_r^D dG + I' dM) / (M_r^D (1 - C') + I' M_Y^D)$.

B5. (a) $w(24 - L) = S + pC, C = \frac{\beta}{p}(24w - S), L = (1 - \beta) \left(24 - \frac{S}{w}\right)$;

(b) $C^* = 55, L = 11, U = 24.597, dU = -0.1118dS$;

(c) $C = 43, L = 10.75, U = 21.5$, tax take = 26.5; (d) $C = 48.375, L = 9.675, U = 21.63$.

6. (a) $P_1 = \frac{\alpha+k}{2}, P_2 = \frac{\delta+k}{2}$; (b) $P_1 = 110, P_2 = 60, Q_1 = 7, Q_2 = 8, \Pi = 610$;

(c) $Q = 50 - 0.5P$ for $0 < P \leq 80, Q = 18 - 0.1P$ for $80 \leq P \leq 180, Q = 0$ for $P \geq 180$;

(d) $Q = 7, P = 110, \Pi = 450$.

C7. (a) $\begin{pmatrix} P(X,Y) & X=1 & X=2 & X=3 \\ Y=1 & 1/12 & 1/4 & 1/6 \\ Y=2 & 1/4 & 1/12 & 1/6 \end{pmatrix}$; (b) $\begin{pmatrix} P(X|Y) & X=1 & X=2 & X=3 \\ Y=1 & 1/6 & 1/2 & 1/3 \\ Y=2 & 1/2 & 1/6 & 1/3 \end{pmatrix}$,

$\begin{pmatrix} P(Y|X) & X=1 & X=2 & X=3 \\ Y=1 & 1/4 & 3/4 & 1/2 \\ Y=2 & 3/4 & 1/4 & 1/2 \end{pmatrix}$; (c) No; (d) $3/4$.

8. -

9. (a) $E(Y_t) = t\mu, \text{var}(Y_t) = t^2 + \sigma^2$; (b) $E(\bar{Y}) = (T + 1)\mu/2$,

$\text{var}(\bar{Y}) = [(T + 1)(2T + 1) + 6\sigma^2]/6T$; (c) Sample mean gives $\text{var} = 1/T$.

10. (a) 10.

D11. (b) $Z = 0.707$, do not reject H_0 ; (c) 0.76; (d) $\Phi\left(\frac{\sqrt{n}}{3} - 1.645\right)$.

12. (a) $t = 58$, clearly significant; (c) $AAAA = 0.004278, CCCC = -0.1454, DDDD =$

$-0.01286, BBBB$ is likely to be 0.000; (d) $\hat{\delta}_0 = \hat{\beta}_0 + \hat{\beta}_1 + \hat{\beta}_2, \hat{\delta}_1 = -\hat{\beta}_1, \hat{\delta}_2 = -\hat{\beta}_2$.

2017

A1. (a) $f(x) = 6(x-1) + 10(x-1)^2 + 10(x-1)^3 + 5(x-1)^4 + (x-1)^5$; (b)(i) $\dot{Y}_t + \gamma(1-\beta)Y_t = \gamma(\alpha+I)$;
(ii) $Y^* = \gamma(\alpha+I)/(1-\beta)$ if $\beta \neq 1$; (iii) $Y_t = Y^* + (3-Y^*)e^{(2-t)(1-\beta)\gamma}$; (iv) $\beta < 1$.

2. (a) $g(x) > 0$ if $x > 3$ or $1 < x < 2$, $g(x) < 0$ if $x < 1$ or $2 < x < 3$; (b) $x^3 - 6x^2 + 11x - 6$;
(d) $\{ (x > 3 \text{ or } 1 < x < 2) \text{ and } \lambda > 0 \text{ and } \alpha > 0 \}$, or $\{ (x < 1 \text{ or } 2 < x < 3) \text{ and } \lambda < 0 \text{ and } \alpha > 0 \}$.

3. (c) 2.

4. (a) $1 + e - \frac{1}{1+e} - \frac{3}{2}$; (b) 128/15.

B5. (a) $q_1 = 20$ $p_1 = 56$ $q_2 = 10$ $p_2 = 106$ $\pi = 1700$ (b) -1.12, -1.06;

(c) $p = 66$ $q_1 = 16$ $q_2 = 14$ $\pi = 1500$; (e) $p = 126$ $q_1 = 0$ $q_2 = 8$ $\pi = 660$; (f) -1.575.

6. (a) $\frac{\alpha(x_2 - b)}{\beta(x_1 - a)}$ if $x_1 \neq a$; (b) $x_1 = \frac{\alpha M + \beta a p - \alpha b q}{p(\alpha + \beta)}$ $x_2 = \frac{\beta M + \alpha b q - \beta a p}{q(\alpha + \beta)}$; (c) $\lambda = \frac{\alpha + \beta}{M - (bq + ap)}$.

C7. (a)

		Y		
		-1	0	+1
X	-1	1/48	3/48	1/4
	+1	11/48	9/48	1/4

, X and Y not independent;

(b)

		-1	0	+1		-1	+1
Y/X	-1	23/48	1/4	13/48	prob	-1	1/3
	+1					+1	2/3

(c) $E(X) = 1/3$, $E(Y) = 1/4$, $E(Y/X) = -5/24$, $E(1/X) = 1/3$; (d) -7/24.

8. (a) $1 - e^{-1/5}$; (b) ≈ 0.672 .

9. (b) $E(X) = \frac{\theta}{2}$, $E(X^2) = \frac{\theta^2}{3}$, $\text{var}(X^2) = \frac{\theta^2}{12}$; (c) $\frac{X}{\theta}$ for $0 \leq X \leq \theta$; $E(\bar{X}) = \frac{\theta}{2}$, $\text{var}(\bar{X}) = \frac{\theta^2}{12N}$;

(e) eg $2\bar{X}$, $\text{var} = \frac{\theta^2}{3N}$.

10. -.

D11. (a) $E(X) = \beta$ $E(X^2) = 2\beta^2$, $\text{var}(X) = \beta^2$; (b) $e^{-\frac{2}{\beta}}$; (c) approximately $N(\beta, \beta^2/100)$; (e) reject H_0 as $Z = 3$; (f) ≈ 0.963 ; (g) $\ln(3.578) \approx 1.275$.

12. (a) 0.055974; (b) $VVVV = 9.5713$, $YYYY = 0.0445$, $ZZZZ = 0.0674$; (c) zero; (d) 209.5;

(e) 0.0961 (f) $lwage_i = \alpha + \epsilon_i$; (h) 0.055974; (i) 0.0961.