Section 3.1

b) True, if A is 3x3 upper triangle, then
$\det(A) = a_{11} a_{22} \cdots a_{nn}$

e) False,

$A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $B = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ $A + B = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

$\det(A+B) = (0)(0) - (0)(0) = 0$

$\det(A) = 1$ $\det(B) = 1$

f) True, since all # pos, det is pos

g) True, all cofactor expansions = 0, therefore,
sum = 0

17) $\det(A) = (6)(-1) - (-3)(-5)$
$= -6 - 15$
$\boxed{= -21}$

30) $\det(A) = (2)(1)(-3) + (-10)(1)(0) + (3)(1)(8)$
$- (2)(1)(8) - (-10)(1)(-3) - (3)(1)(0)$

$= -6 + 24 - 16 - 30$

$\boxed{= -28}$

36) $\det(A) = 4(-2)(-6)(-3)$
$\boxed{= -144}$

45) $\det(A) = e^{2t}\, 3e^{3t}\, 16e^{-4t} + e^{3t}\, -4e^{-4t}\, 4e^{2t} + e^{-4t}\, 2e^{2t}\, 9e^{3t}$
$- e^{2t}\, -4e^{-4t}\, 9e^{3t} - e^{3t}\, 2e^{2t}\, 16e^{-4t} - e^{-4t}\, 3e^{3t}\, 4e^{2t}$

$=$ $= 42e^{t}$

54a) $\det(cA) = ca_{11}ca_{22} - ca_{12}ca_{21}$

$c^2\det(A) = c^2[a_{11}a_{22} - a_{12}a_{21}]$

$c^2a_{11}a_{22} - c^2a_{12}a_{21}$

$= c^2[a_{11}a_{22} - a_{12}a_{21}]$ ✓

Section 3.2

15) A is invertible if $\det(A) \neq 0$

$\det(A) = (-1)(-1) - (1)(1)$

$= 1 - 1 = 0$

$\boxed{\text{A is NOT invertible}}$

17) $\det(A) = (-1)(-2)(5) + (2)(1)(8) + (3)(5)(-2)$
$- (-2)(1)(-1) - (5)(5)(2) - (8)(-2)(3)$

$= 10 + 16 - 30 - 2 - 50 + 48$

$= -8 \neq 0$

$\boxed{\text{A is invertible}}$

18) $\det(A) = (2)(5)(1) + (6)(1)(2) + (-1)(3)(0)$
$- (0)(1)(2) - (1)(3)(6) - (2)(5)(-1)$

$= 10 + 12 - 18 + 10$

$= 14$

22) $\left[\begin{array}{ccc|c} 1 & 2 & k & 0 \\ 2 & -k & 1 & 0 \\ 3 & 6 & 1 & 0 \end{array}\right]$

$-2R_1 + R_2 = \left[\begin{array}{ccc|c} 1 & 2 & k & 0 \\ 0 & -k-2 & 1-2k & 0 \\ 3 & 6 & 1 & 0 \end{array}\right]$

$-3R_1 + R_3 = \left[\begin{array}{ccc|c} 1 & 2 & k & 0 \\ 0 & -k-2 & 1-2k & 0 \\ 0 & 0 & 1-3k & 0 \end{array}\right]$

$1 - 3k = 0$

$-3k = -1$

$\boxed{k = 1/3}$

29) $\det(B) = (-6ac - 2ad) - (-6ac - 2bc)$

$= -6ac - 2ad + 6ac - 2bc$

$\boxed{= -2ad - 2bc}$

30) $\det(B) = -\det(A)$

$= -12\det(A)$

$= -12(1)$

$\boxed{= -12}$

32) $\det(B) = -bc + 4ab - (-ad + 4b)$

$= -bc + 4ab + ad - 4b$

35) $R_1 \longleftrightarrow R_2$

$\det(B) = -\det(A)$

$-3R_2$

$\det(B) = 3\det(A)$

$-4R_1 + R_3 = R_j$

$\det(B) = 3\det(A)$

$\boxed{\det(B) = -9}$