

SHOW ALL WORK ON THIS TEST OR ON SEPARATE PAPER. Circle answers.
TURN IN ALL WORKSHEETS. CALCULATORS ARE REQUIRED ON THIS TEST.
FOR GRAPHING CALCULATOR SOLUTIONS, INDICATE METHODS (GRAPH) USED.

1. Solve for X:

$$X(X - 21) = 100$$

2. Calculate:

a) $\frac{8.9 \times 10^{12}}{6.4 \times 10^{-23}}$

b) $\sqrt[3]{1,000,000}$

c) $\sqrt[5]{1,000,000}$

d) $\frac{11 - 10i}{4 + i}$

3. Simplify the radical:

a) $\sqrt{108X^9Y^8}$

4. Give the value if possible:

a) $-27^{2/3}$

b) $-25^{3/2}$

b) $\sqrt[3]{108X^9Y^8}$

c) $(-27)^{-2/3}$

d) $(-25)^{3/2}$

5. Find the vertex and graph

$$Y = -4X^2 + 20X + 6$$

6. Find the vertex and graph:

$$X = Y^2 - 8Y + 12$$

7. Find the roots in exact (radical) form. Use graphing calculator methods and synthetic division. Tell what you did:

$$X^4 - 6X^3 - 8X^2 + 48X + 64 = 0$$

8. Find the domain:

a) $Y = 3X - 2$

b) $Y = \frac{X + 3}{X^2 + 3X - 4}$

c) $Y = \sqrt{X^2 + 3X - 4}$

9. Solve (use your favorite method)

$$\begin{aligned} X + 2Y + Z &= -1 \\ 2X + 3Y + 2Z &= 5 \\ -X + Y + 5Z &= 4 \end{aligned}$$

10. Solve the system:

$$\begin{aligned} XY &= 30 \\ Y &= 2X - 7 \end{aligned}$$

11a) $\log_5 30 = \underline{\hspace{2cm}}$

b) $\ln e = \underline{\hspace{2cm}}$

c) $\log_{10} 10^{3X} = \underline{\hspace{2cm}}$

d) $\ln (e^{10} - e^9) = \underline{\hspace{2cm}}$

12. Solve for X:
 $12^{(3X - 2)} = 5^X$

13. A population grows from 6,000 in 1990 to 8,900 in 1992. If $Y = Y_0 e^{kt}$, find "k" and estimate the population in 2002.

1. $x(x-21) \equiv 100$
 $x^2 - 21x - 100 = 0$
 OR POLY $(x-25)(x+4) = 0$
 $x = 25 \quad x = -4$

3a) $\sqrt{108x^9y^8}$
 $= \sqrt{36x^8y^8} \sqrt{3x}$
 $= 6x^4y^4\sqrt{3x}$

b) $\sqrt[3]{108x^9y^8}$
 $\sqrt[3]{27x^9y^6} \sqrt[3]{4y^2}$
 $3x^3y^2\sqrt[3]{4y^2}$

2a) $8.9 \text{ EE } 12 \div 6.4 \text{ EE } (-) 23$
 ENTER 1.39×10^{35}
 b) $3 \text{ CUST } \sqrt{x} 1,000,000 =$
 $= 100$

4a) $-27^{2/3} = -(\sqrt[3]{27})^2 = -9$
 b) $-25^{3/2} = -(\sqrt{25})^3 = -125$
 c) $(-27)^{-2/3} = (\sqrt[3]{-27})^{-2} = (-3)^{-2} = \frac{1}{9}$
 d) $(-25)^{3/2} = (\sqrt{-25})^3 = \text{No Real}$

c) $5 \text{ CUST } \sqrt{x} 1,000,000$
 $= 15.85$
 d) $(11 \ 9 \ -10) \div$
 $(4 \ 9 \ 1) = (2, -3)$

5. $y = -4x^2 + 20x + 6$
 GRAPH $y1 = -4x^2 + 20x + 6$
 F3 ZOOM, F4 ZST, F5 GRAPH
 Now, either ZOOMOUT or
 MORE / F1 MATH MORE
 F2 (FMAX) ENTER
 $(2.5, 31)$

6. $x = y^2 - 8y + 12$ Parabola Opens Right
 $\frac{x+16}{-12} = \frac{y^2 - 8y + 16 + 12}{-12}$
 $x+4 = (y-4)^2 \quad \sqrt{(-4, 4)}$

7. $x^4 - 6x^3 - 8x^2 + 48x + 64 = 0$
 2nd POLY order = 4 ENTER
 $1, -6, -8, 48, 64$ ENTER
 $x_1 = 5.46410161514$
 $x_2 = 4 \quad x_3 = -2$
 $x_4 = -1.46410161514$

Synthetic Division:
 $4 \mid 1 \ -6 \ -8 \ 48 \ 64$
 $\downarrow \quad 4 \ -8 \ -64 \ -64$
 $1 \ -2 \ -16 \ -16 \ 0$
 $-2 \mid 1 \ -2 \ -16 \ -16$
 $\downarrow \quad -2 \ 8 \ 16$
 $1 \ -4 \ -8 \ 0$
 $x^2 - 4x - 8 = 0$

$x^2 - 4x + 4 = 8 + 4$
 $(x-2)^2 = 12$
 $x-2 = \pm\sqrt{12}$
 $x = 2 \pm 2\sqrt{3}$

8a) $(-\infty, \infty)$
 a) $x^2 + 3x - 4 \neq 0$
 $(x+4)(x-1) \neq 0$
 All $x \neq -4, 1$
 c) $x^2 + 3x - 4 \geq 0$
 Extremes
 $(-\infty, -4] \cup [1, \infty)$

9. $x + 2y + z = -1$
 $2x + 3y + 2z = 5$
 $-x + y + 5z = -4$
 $D = \begin{vmatrix} 1 & 2 & 1 \\ 2 & 3 & 2 \\ -1 & 1 & 5 \end{vmatrix} = -6$
 $XN = \begin{vmatrix} -1 & 2 & 1 \\ 5 & 3 & 2 \\ 4 & 1 & 5 \end{vmatrix} = -54$
 $YN = \begin{vmatrix} 1 & -1 & 1 \\ 2 & 5 & 2 \\ -1 & 4 & 5 \end{vmatrix} = 42$
 $ZN = \begin{vmatrix} 1 & 2 & -1 \\ 2 & 3 & 5 \\ -1 & 1 & 4 \end{vmatrix} = -24$
 $x = \frac{-54}{-6} \quad y = \frac{42}{-6} \quad z = \frac{-24}{-6}$
 $(9, -7, 4)$

12. $\ln(3x-2) = \ln 5 \quad x$
 $(3x-2)\ln 2 = \ln 5$
 $3x \ln 2 = \ln 5 + 2 \ln 2$
 $3x \ln 2 = \ln 5 + 2 \ln 2$
 $x = \frac{\ln 5 + 2 \ln 2}{3 \ln 2}$
 $= 0.85$

13. $y = 6000 e^{(x/12)}$
 $\ln \frac{89}{6000} = \ln e^{(x/12)}$
 $\ln \frac{89}{6000} = \frac{x}{12}$
 $x = 12 \ln \left(\frac{89}{6000} \right)$
 ≈ 1971.9545758
 $y = 6000 e^{(x/12)}$
 $y = 63,912.2$

10. $xy = 30$
 $y = 2x - 7$
 $x(2x-7) = 30$
 $2x^2 - 7x - 30 = 0$
 $(2x+5)(x-6) = 0$
 $x = -\frac{5}{2} \quad x = 6$
 $y = 2(-\frac{5}{2}) - 7 \quad y = 2(6) - 7$
 $y = -12 \quad y = 5$
 $(-\frac{5}{2}, -12) \quad (6, 5)$

11a) $\frac{\ln 30}{\ln 5} = (2, 11)$
 a) ①
 c) ~~3~~
 d) ①.54