

1. $\frac{x^2 - 9 - 14x - 6}{x^2 - 1 - 4x} = 0$
 $x^2 - 14x - 15 = 0$
 $(x-15)(x+1) = 0$
 $x = 15, -1$
A

2. $(2x+3x)^2 = (1-x)(7-x)$
 $25x^2 = 7 - 8x + x^2$
 $24x^2 + 8x - 7 = 0$
 $x = \frac{-8 \pm \sqrt{64 + 4(24)(-7)}}{2(24)}$
 $x = \frac{-8 \pm \sqrt{1680}}{48}$
 $x = \frac{-8 \pm 41.43}{48}$
 $x = \frac{33.43}{48} \approx 0.696$
B

3. $3xy - 4 = (y+3)(1-x)$
 $3xy - 4 = y + 3 - xy - 3x$
 $4xy - 7 = y - 3x$
 $4xy - y = -3x + 7$
 $y(4x-1) = -3x+7$
 $y = \frac{-3x+7}{4x-1}$
A

4. $3(\sqrt{x-1}) - 1(\sqrt{x-2}) = 1$
 $3\sqrt{x-1} - \sqrt{x-2} = 1$
 $3\sqrt{x-1} = 1 + \sqrt{x-2}$
 $9(x-1) = 1 + 2\sqrt{x-2} + (x-2)$
 $8x - 9 = 2\sqrt{x-2} + x - 1$
 $7x - 8 = 2\sqrt{x-2}$
 $49(x-2) = 4(x-2)$
 $45(x-2) = 0$
 $x = 2$
D

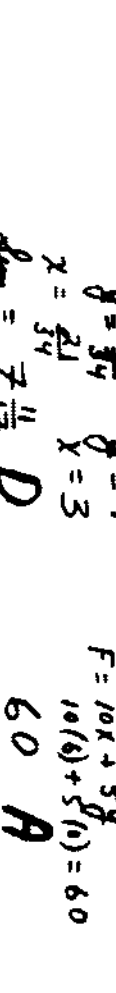
5. Let $M = x^5$
 $36M^4 + 7M^2 - 4 = 0$
 $(9M^2 - 1)(9M^2 + 4) = 0$
 $9M^2 - 1 = 0$
 $3M = \pm 1$
 $M = \pm \frac{1}{3}$
 $x^5 = \pm \frac{1}{3}$
 $x = \pm \sqrt[5]{\frac{1}{3}}$
D

6. $.03172x^2 - 2.054x - 32.45 = 0$
 $x = \frac{2.054 \pm \sqrt{8.3336344}}{2(.03172)}$
 $x_1 \approx 77.88$
 $x_2 \approx -13.12$
 sum = 91
C

7. $3x - |2x+1| = 4$ or $3x - |2x+1| = -4$
 $3x - 4 = |2x+1|$
 $3x - 4 = 2x+1$ or $3x - 4 = -(2x+1)$
 $x = 5$ or $x = \frac{3}{5}$
 Does not check $x = \frac{3}{5}$
B

8. Subtract the equations
 $5x - 3y - 8 = 0$
 $x = \frac{3y+8}{5}$
 $9x^2 + 18y + 9 = 6y + 6 - 5y + 1 = 0$
 $9x^2 + 18y + 9 = 1 - 5y + 1 = 0$
 $9x^2 + 23y + 8 = 0$
 $9(\frac{3y+8}{5})^2 + 23y + 8 = 0$
 $9(9y^2 + 48y + 64) + 115y + 40 = 0$
 $81y^2 + 432y + 576 + 115y + 40 = 0$
 $81y^2 + 547y + 616 = 0$
 $y = \frac{-547 \pm \sqrt{547^2 - 4(81)(616)}}{2(81)}$
 $y = \frac{-547 \pm \sqrt{299209 - 199392}}{162}$
 $y = \frac{-547 \pm \sqrt{100817}}{162}$
D

9. $(1,1)(2,0)(6,0)(1,9)$
 $F = 10x + 5y$
 $10(6) + 5(9) = 60 + 45 = 105$
A



10. $3M^2 + 2M - 120 = 0$
 $(3M+20)(M-6) = 0$
 $M = 6$
B

10. $\frac{6x^5}{x^2} + (1-2)x = 6x^3 - 2x$
 $6x^3 - 2x = 30 - 1$
 $6x^3 - 2x = 29$
 $3x^3 - x = 14.5$
 $x = -7$
A

11. $\frac{1}{x} = 3 - \frac{2}{y}$
 $\frac{1}{x} = \frac{3y-2}{y}$
 $y = 3y - 2$
 $-2y = -2$
 $y = 1$
 $x = \frac{y}{3y-2} = \frac{1}{3-2} = 1$
D

12. $m^2x^2 - 4m^2x - 1 = 0$
 $x = \frac{4m^2 \pm \sqrt{16m^4 + 4m^2}}{2m^2}$
 $x = \frac{4m^2 \pm 2m\sqrt{4m^2 + 1}}{2m^2}$
 $x = \frac{2m^2 \pm m\sqrt{4m^2 + 1}}{m^2}$
E

13. $A_1A_2x^2 = A_3x$
 $(x+1)A_1A_2 = xA_3$
 $x^2A_1A_2 - xA_1A_2 = xA_3$
 $x^2A_1A_2 - xA_1A_2 - xA_3 = 0$
 $x(x^2A_1A_2 - xA_1A_2 - A_3) = 0$
 $x = 0$ or $x^2A_1A_2 - xA_1A_2 - A_3 = 0$
A

14. $\log_2(x^2 - 3x) = 2$
 $x^2 - 3x - 4 = 0$
 $(x-4)(x+1) = 0$
 $x = 4$ or $x = -1$
E

15. $\pi + \pi T^2 = \pi + 1 + T$
 $\pi T^2 - T - 1 = 0$
 $T = \frac{1 \pm \sqrt{1+4\pi}}{2\pi}$
B

16. $0 < \frac{1}{2}$ and $\frac{1}{2} < \frac{1}{3}$
 $\frac{1}{2} < \frac{1}{3}$
B

17. $3x - |2x+1| = 4$ or $3x - |2x+1| = -4$
 $3x - 4 = |2x+1|$
 $3x - 4 = 2x+1$ or $3x - 4 = -(2x+1)$
 $x = 5$ or $x = \frac{3}{5}$
 Does not check $x = \frac{3}{5}$
B

18. $1+2i$

1	2	-3	20
1	1+2i	-1+8i	-20
1	3+2i	-4+8i	0
1	-2i	4-8i	0

 $x+y=0$
B

19. $\log_2 x \log_2 y = 3 \rightarrow x^3 = y^4$
 $\log_2(x^4y) = 5 \rightarrow x^5 = y^4y = 4(x^4)$
 $x^5(x^2 - y) = 0$
 $x = 0$ or $x = 2$
A

20. $3M^2 + 2M - 120 = 0$
 $(3M+20)(M-6) = 0$
 $M = 6$
B

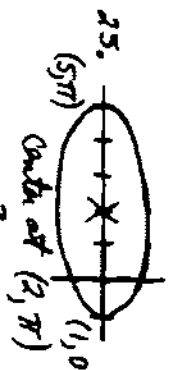
21. $5x + y = 1/x$
 $(2x - 3)(x + y) = 0$
 $2x + y = 3$ D
 $x = \pm \frac{3}{2}$

22. $(x - y)(x^2 + xy + y^2) = 26$
 $x^2 + xy + y^2 = 13$
 $(y + x)^2 + (y + x)y + y^2 = 13$
 $y^2 + 4y + 4 + y^2 + 2y + y^2 = 13$
 $3y^2 + 6y - 9 = 0$
 $y^2 + 2y - 3 = 0$
 $y = -3$ $y = 1$
 $x = -1$ $x = 3$
B III I

23. $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$
 $b^2 - 4ac$
 $(4)^2 - 4(1)(1) = 16 - 4 = 12 > 0$
 HYPERBOLA **B**

24. $(5 + 2x)(-6) = (3)(x - 1) = 3$
 $-30 - 12x - 3x + 3 = 3$
 $-15x = 30$
 $x = -2$ **B**

26. $x = 3t^2$
 $y = 2t + 1 \rightarrow t = \frac{y-1}{2}$
 $x = 3 \left(\frac{y-1}{2}\right)^2$
 $x = 3 \left(\frac{y^2 - 2y + 1}{4}\right)$
 $4x = 3y^2 - 6y + 3$
 $0 = 3y^2 - 4x - 6y + 3$
D



$a = 3$
 $0 < e < 1$ for ellipse
 Focus $(0, 0)$, then
 $c = 2$
 $e = \frac{c}{a} = \frac{2}{3}$
 From any point on the ellipse,
 $d_1 = e d_2$
 $d_1 = \frac{2}{3} d_2$
 $\frac{3}{2} = d_1$
 $\frac{3}{2} = d_2$

$r = \frac{ep}{1 + e \cos \theta}$
 $= \frac{\frac{2}{3} \cdot \frac{5}{2}}{1 + \frac{2}{3} \cos \theta} = \frac{10}{6 + 4 \cos \theta}$
B

27. $\frac{6x-13}{(x-1)^2} = \frac{A}{x-1} + \frac{B}{(x-1)^2}$
 $6x - 13 = A(x-1) + B$
 $6x - 13 = Ax - A + B$
 $\begin{cases} 6 = A \\ -13 = -A + B \end{cases}$
 $-13 = -6 + B$
 $-7 = B$
B

$\frac{6}{x-1} = \frac{7}{(x-1)^2}$
B

29. $\frac{2^x - 2}{3} = 4$
 $2^x - 2 = 12$
 $2^x = 14$
 $x = \log_2 14$

$2^{2x} - 12(2^x) - 1 = 0$
 $2^x = \frac{12 \pm \sqrt{144 - 4(1)(-1)}}{2(1)}$

$2^x = \frac{12 \pm \sqrt{148}}{2} = 6 \pm \sqrt{37}$
 $6 - \sqrt{37}$ astronomical

$2^x = 6 + \sqrt{37}$
 $x \ln 2 = \ln(6 + \sqrt{37})$
 $x = \frac{\ln(6 + \sqrt{37})}{\ln 2}$
A

28. To maximize:
 $-\frac{1}{2} \cos \theta$ must be a max.
 $|\cos \theta| \leq 1$
 $-1 \leq \cos \theta \leq 1$
 when $\cos \theta = -1$, $-\frac{1}{2} \cos \theta$
 will be a max and will
 $\ln e^{-\frac{1}{2}}(-1) = \frac{1}{2}$
 $r = \frac{2}{5} + \frac{1}{2} = \frac{6}{10} + \frac{5}{10} = \frac{11}{10}$
C

30. $5(x) = 1 + e^x$

