Answers:

1. $(-1,4)$
2. 5
3. $n-1$
4. 2 and $-4/5$
5. $15/2$
6. $3x^2+3xh+h^2+2x+h+2$
7. $200/3$
8. $\pm1,\ \pm3$
9. 17
10. 6×17
11. $\left[-1,3/2\right]$
12. 11
13. $(-6,2)$
14. $y=3x^2-x+2$
15. x^2-3x+4
16. 35
17. $(x-7y-17)(x+5y+7)$
18. 1
19. -2
20. $\dfrac{2+\sqrt{2}-\sqrt{6}}{4}$
21. 11 and -1
22. 6
23. $16\sqrt{3}\pi$
24. $(-4,0)$ and $(0,-2)$
25. $2/99$

Solutions:

1. $x^2-3x-4<0 \Rightarrow (x-4)(x+1)<0$, and the expression is negative if one factor is positive and the other is negative. This occurs when x is in the interval $(-1,4)$.

2. The perpendicular bisector of the two points is $y=-x+8$, and when $x=3$, $y=5$.

3. $\frac{n(n+1)!-2n!}{(n+1)!+n!}=\frac{n!(n(n+1)-2)}{n!((n+1)+1)}=\frac{n^2+n-2}{n+2}=n-1$

4. $(1-k)^2+(1-2k)^2=10 \Rightarrow 1-2k+k^2+1-4k+4k^2=10 \Rightarrow 5k^2-6k-8=0 \Rightarrow$ $(5k+4)(k-2)=0 \Rightarrow k=2$ or $k=-4/5$

5. Slopes of two lines are $-k/5$ and $2/3$, so $-k/5=-3/2 \Rightarrow k=15/2$

6. $$\frac{f(x+h)-f(x)}{h}=\frac{(x+h)^3+(x+h)^2+2(x+h)-1-x^3-x^2-2x+1}{h}$$
$$=\frac{x^3+3x^2h+3xh^2+h^3+x^2+2xh+h^2+2x+2h-1-x^3-x^2-2x+1}{h}$$
$$=\frac{h(3x^2+3xh+h^2+2x+h+2)}{h}=3x^2+3xh+h^2+2x+h+2$$

7. $30+.15x=32+.12x \Rightarrow .03x=2 \Rightarrow x=200/3$

8. $0=x^4-10x^2+9=(x^2-9)(x^2-1)=(x-3)(x+3)(x-1)(x+1) \Rightarrow x=\pm 3$ or $x=\pm 1$

9. $\frac{(w+1)!}{2!(w-1)!}=\frac{9w!}{1!(w-1)!} \Rightarrow (w+1)!=18w! \Rightarrow w+1=18 \Rightarrow w=17$

10. $2w+2(3w-1)=46 \Rightarrow 8w-2=46 \Rightarrow 8w=48 \Rightarrow w=6 \Rightarrow 3w-1=17$, so the dimensions are 6×17

11. $-5\le 4b-1\le 5 \Rightarrow -4\le 4b\le 6 \Rightarrow -1\le b\le 3/2$, so the answer is $\left[-1,3/2\right]$

12. $\begin{vmatrix} 2 & 3 & 0 \\ 1 & -1 & 2 \\ 5 & 1 & 3 \end{vmatrix} = -6+30+0-0-4-9=11$

13. $3x+4y=-10$ and $x-5y=-16 \Rightarrow 3(5y-16)+4y=-10 \Rightarrow 19y=38 \Rightarrow y=2 \Rightarrow$
$x=5(2)-16=-6$, so the answer is $(-6,2)$

14. $y=ax^2+bx+c$, so $4=a+b+c$, $6=a-b+c$, and $2=c$. Adding the first two equations together, $10=2a+2c=2a+4$, so $a=3$. Since $4=a+b+c$, $b=-1$. Thus the equation is $y=3x^2-x+2$

15. $(x^4+x^3-7x^2+13x+4)\div(x^2+4x+1)=x^2-3x+4$

16. $14(.3)+x(1)=(14+x)(.8) \Rightarrow 4.2+x=11.2+.8x \Rightarrow .2x=7 \Rightarrow x=35$

17. $(x-3)^2-2(x-3)(y+2)-35(y+2)^2=((x-3)-7(y+2))((x-3)+5(y+2))$
$=(x-7y-17)(x+5y+7)$

18. $2^{y-1}=2^y-1 \Rightarrow \frac{1}{2}\cdot 2^y=2^y-1 \Rightarrow 1=\frac{1}{2}\cdot 2^y \Rightarrow 2=2^y \Rightarrow y=1$

19. $3(3x+4)+4=3x+4 \Rightarrow 9x+16=3x+4 \Rightarrow 6x=-12 \Rightarrow x=-2$

20. $\frac{1}{\sqrt{2}+\sqrt{3}+1}\cdot\frac{\sqrt{2}-\sqrt{3}+1}{\sqrt{2}-\sqrt{3}+1}=\frac{\sqrt{2}-\sqrt{3}+1}{2\sqrt{2}}=\frac{2-\sqrt{6}+\sqrt{2}}{4}$

21. $0=(x-5)^2-4|x-5|-12=(|x-5|-6)(|x-5|+2) \Rightarrow |x-5|=6 \Rightarrow x=11$ or $x=-1$

22. $(6+x)(12+x)=216 \Rightarrow 72+18x+x^2=216 \Rightarrow x^2+18x-144=0 \Rightarrow (x+24)(x-6)=0$
$\Rightarrow x=6$ since x must be positive in the context of this problem.

23. $3x^2+4y^2+18x-32y-5=0 \Rightarrow 3(x+3)^2+4(y-4)^2=96 \Rightarrow \frac{(x+3)^2}{32}+\frac{(y-4)^2}{24}=1$.
Since $a=\sqrt{32}=4\sqrt{2}$ and $b=\sqrt{24}=2\sqrt{6}$, the area enclosed is $\pi(4\sqrt{2})(2\sqrt{6})=16\sqrt{3}\pi$.

24. Squaring the second equation gives $x^2 + 4xy + 4y^2 = 16$, and because of the second equation, $4xy = 0 \Rightarrow x = 0$ or $y = 0$. When $x = 0, y = -2$. When $y = 0, x = -4$. Therefore, the solutions are $(0,-2)$ and $(-4,0)$.

25. $\log x + 2 = \log(x+2) \Rightarrow 2 = \log(x+2) - \log x = \log\frac{x+2}{x} \Rightarrow \frac{x+2}{x} = 100 \Rightarrow 99x = 2$
$\Rightarrow x = 2/99$