

SOLUTIONS

1. A: $f(225)=4$ and $f(4)=\sqrt{3}$;

B: $4 = \sqrt{1 + \sqrt{x}}$, $16 = 1 + \sqrt{x}$, $x = 225$

C: $\sqrt{1 + \sqrt{x-1}} = 2$, $3 = \sqrt{x-1}$, $x = 10$.

D: $2 = \sqrt{1 + \sqrt{\frac{1}{x}}}$, $3 = \sqrt{\frac{1}{x}}$, $9 = \frac{1}{x}$ so $x = \frac{1}{9}$

Answers: $A = \sqrt{3}$, $B = 225$, $C = 10$, $D = \frac{1}{9}$
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2. $a=2i$ and $b=3i$.

$A = -6$, $B = \frac{2}{3}$, $C = 5i$, $D = 25i^2 = -25$

3. A: $C(10,2)(x)^8(-2)^2$ has coefficient $45(4) = 180$.

B: $(i-1)^{10} = (-2i)^5 = -32i^5 = -32i$

C: $f(\sqrt{2} + 2) = (\sqrt{2})^{10} = 2^5 = 32$

D: $\frac{2^{10}}{(1+i)^{10}} = \frac{2^{10}}{(2i)^5} = \frac{2^5}{i^5} = \frac{32}{i} = -32i$

Answers: $A=180$, $B= -32i$, $C=32$, $D= -32i$

4. $(x-1)^2 - (y-2)^2 = 4$; $\frac{(x-1)^2}{4} - \frac{(y-2)^2}{4} = 1$

A: $a=2$, $b=2$ so the transverse has length 4.

B: Slope is $4/4$ which is 1.

C: asymptote $(y-2)=1(x-1)$ which gives $x-y=-1$.

D: $a^2 + b^2 = c^2$, $4 + 4 = c^2$. So $c = 2\sqrt{2}$.

Answers: $A=4$ $B=1$ $C= -1$ $D=2\sqrt{2}$
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5. There is now $20(0.10)$ salt in the solution, which is 2 L.

A: $\frac{2+x}{20+x} = \frac{3}{25}$ so $x=5/11$.

B: adding $5(0.20)=1$ L. So percent is 3 liters out of $25L=12$

C: increase is 5, divided by 20, which is 25%

D: $\frac{2}{20-x} = \frac{1}{4}$ so $x=12$ L

Answers: $A = \frac{5}{11}$ $B=12$ $C=25$ $D=12$
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6. A: The min occurs when $|x+5|=3$ and this solves to $x = -2$ or $x = -8$. Least value is $x = -8$.

B: $x^2 - 2x - 15 < 0$. The graph has roots 5 and -3 and is negative between. The least x is -2.

C: The domain of the expression is $[-3,3]$ and for $x=-3$ or 3 , the expression=0. For $x=2$ or -2 , the inequality is true, and so $x = -2$ is least x .

D: the solution is $(-3,5)$ and the least x is -2.

Answers: $A = -8$ $B = -2$ $C = -2$ $D = -2$
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7. A: factors of 40 from the set are 1, 5, 8. Probability = $3/5$
 B: $C(5,2)=10$. Since 6+8 and 5+8 are the only sums greater than 11, probability= $2/10$ or $1/5$
 C: out of 3 odds the probability(3 or 5)= $2/3$
 D: $C(5,3)=10$ and only the least 3 sum to 9. $P=1/10$

$$\text{Answers: } A = \frac{3}{5}, B = \frac{1}{10}, C = \frac{2}{3}, D = \frac{1}{10}$$

8. f has a double root at 2. g has no roots. h has roots 5, 1.
 A: 2 B: g is always positive. Answer 0. C: $g(3)=5, f(5)=9$.

D: Quadratic formula: $\frac{1 \pm \sqrt{1-4k}}{2} = 1, 1 \pm \sqrt{1-4k} = 2, \pm \sqrt{1-4k} = 1$ so $k=0$.

$$\text{Answers: } A=2, B=0, C=9, D=0$$

9. $A = \sqrt{5+A}$, since A is positive, gives $A^2 - A - 5 = 0, A = \frac{1 + \sqrt{21}}{2}$.

$B = \frac{2}{1+B}$ solves to $B=1$ or $B=-2$. Since the expression is positive, $B=1$.

C: $10 = \sqrt{x-10}$ and $100 = x-10$ so $C=110$.

D: Add the two preceding terms. 1,1,2,3,5,8,13,21,34,55,89,144. Answer 144.

$$\text{Answers: } A = \frac{1 + \sqrt{21}}{2} \text{ (positive only!), } B=1, C=110, D=144$$

10. A: $\frac{3}{6} = \frac{k}{5}$ (the second is the negative reciprocal of $-5/k$). $A=5/2$.

B: You can either substitute the point into either equation, or get the intersection. $u=0$.

C: $3x-6y=6, 3x-y=6$ subtracts to $-5y=0$ and $y=0$. At $y=0, x=2$. Sum=2.

D: L intercepts are 2 and -1. P intercepts are -6 and 2. Sum is -3.

$$\text{Answers: } A = \frac{5}{2}, B=0, C=2, D=-3.$$

11. A: when $x=1, y=2\sqrt{2}$ so distance= $4\sqrt{2}$ B: Each side is $3\sqrt{2}$ so area = 18.

C: area of the triangle is $1/2(6)(3)=9$. Area of the circle is 9π . Probability= $\frac{1}{\pi}$

D: circumference $6\pi/\pi=6$.

$$\text{Answers: } A=4\sqrt{2}, B=18, C=\frac{1}{\pi}, D=6$$

12. A: $2(2)(3)-3=9$, $2(1)(9)-9=9$

C: $2(2x)-x=7$ $x=7/3$

B: $(2-1/4)-(2-1/3)=-1/4+1/3=1/12$

D: $1\neq x=0$ $2x-x=0$, $x=0$

Answers: A=9	B= $\frac{1}{12}$	C= $\frac{7}{3}$	D=0
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13. A: 3 B: 8 C: 13 D: 7

14. A: $(x-1)^2 + 3(x-1)$ has constant -2

B: $(x-1)^2 + 3(x-1)=2$; $x^2 + x - 4 = 0$

$$x = \frac{-1 + \sqrt{17}}{2}$$

C: $k = -2$, $f(-2)=f(-3+1)=9-9=0$

D: $g(-1) = -5$ $f(-5)=36-18=18$

A: -2	B: 0	C: $x = \frac{-1 + \sqrt{17}}{2}$	D: 18
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