

$$1. x^n \cdot x^{-m} = x^{-m} = \frac{1}{x^m}$$

B

2. If $x=-1$ then

$$(2x+1)(x-5) = (-1) \cdot (-6) > 6 > 0$$

A

3. $y = mx + b$, b = intercept

B

$$4. 2^a = 4^b = 64$$

$$\Rightarrow 2^a = 2^{2b} = 2^6, a=6, b=3$$

$$a+b=9 \Rightarrow \boxed{C}$$

5. $f(x) = \frac{x^2}{x^2+1}$ is defined everywhere

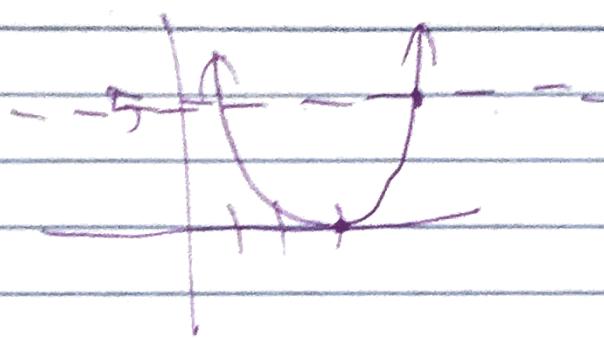
E

$$6. y = 2x^3 + x^2$$

$$x = -2 \Rightarrow y = 2 \cdot (-8) + 4 = \textcircled{-12} - 12$$

$$|-12| = 12 \quad \boxed{C}$$

7. $f(x) = (x-3)^2$



Want: $\sqrt{5} = x-3$

$$x = 3 + \sqrt{5}$$

$$\approx 5.2$$

E

8.

26, 32, 37, 45, 43, 56, 58, 58, 61, 63, 66

D

5 here ↑ 5 there →

$$\text{median} = 56$$

9. $g(f(x)) = \frac{1}{2x+1} - 2 = 0$

$$\Rightarrow 2x+1 = \frac{1}{2} \Rightarrow x = -\frac{1}{4}$$

B

10. $2x^2 - 4 = a \Rightarrow 2(x^2 - 2) = a$

B

11. Looks like $p(x) \approx x^2$

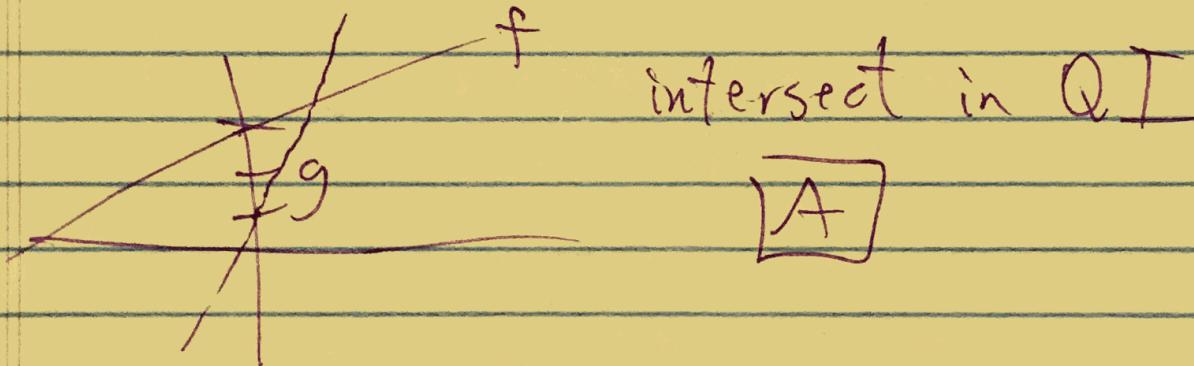
C

$$12. \quad y_n = 1 - (-1)^n = \begin{cases} 0 & n \text{ even} \\ 2 & n \text{ odd} \end{cases}$$

B

13. Vertical line test \Rightarrow E

$$14. \quad f(x) = cx + 3, \quad g(x) = dx + 1, \quad 0 < c < d$$



$$15. \quad \overbrace{\text{green } 6-5-4-3-2-1 \text{ red}}^{\rightarrow} \\ = 6 \quad \boxed{A}$$

$$16. \quad \log(x) = 1.58$$

$$\log(2x) = \log(x) + \log(2) \approx 2.27$$

B

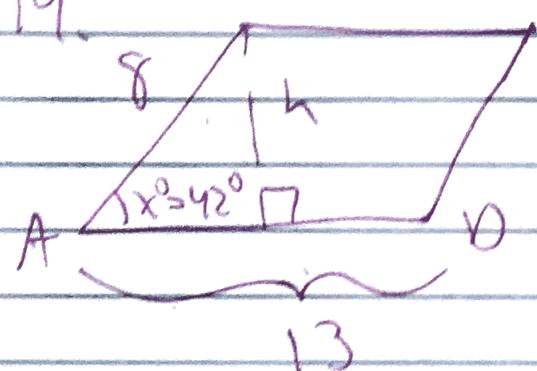
$$17. \quad g_n = 1.5 \cdot g_{n-1}, \quad g_1 = 100$$

$$g_4 = (1.5)^3 \cdot 100 \approx 338$$

A

18. I is false due to $x=-2$
 II is true
 III is false, x could be -2
B

19.



$$\sin(42^\circ) = \frac{h}{8}$$

$$h = 8 \sin(42^\circ) \approx 5.35$$
A

20. $f(1) = -3$, ~~$f(3)$~~ $f(3) = 2$

$$m = \frac{2 - (-3)}{3 - 1} = \frac{5}{2}$$

$$(y-2) = \frac{5}{2}(x-3) \Rightarrow y = \frac{5}{2}x - \frac{15}{2} + \frac{4}{2}$$

$$= \frac{5}{2}x - \frac{11}{2}$$
B

21. $\cos x = \sec x = \frac{1}{\cos x}$

$$\Rightarrow \cos^2 x = 1 \Rightarrow x = 0 \text{ works, } \boxed{C}$$

22. $g(x) = 3(\underbrace{\sin(2x+1)}_{\in [-1,1]}) - 1$

$$\min: -3 - 1 = -4 \Rightarrow \boxed{A}$$

$$\max: 3 - 1 = 2$$

23. $y = x$ and $\frac{x^2}{16} + \frac{y^2}{25} = 1$
 $\Rightarrow \frac{x^2}{16} + \frac{x^2}{25} = 1$
 $x^2 = \frac{1}{\frac{1}{16} + \frac{1}{25}} \approx 9.756$
 $\Rightarrow x = \sqrt{9.756} \approx 3.12$, A

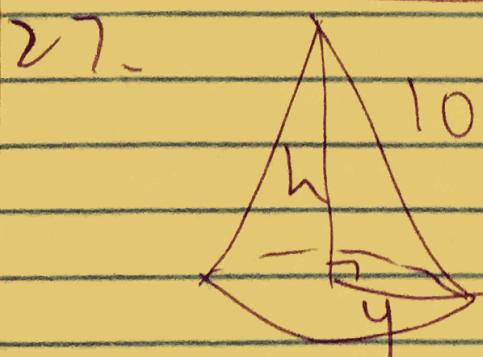
24. $\frac{2}{3}$ red \Rightarrow 20 red, 10 purple works, B

25. $f(f(3)) = f(4) = 2$, C

26. $f \cdot g = 0$ if $f = 0$ or $g = 0$

zeros: -2, 3, 7, -3, -1, 4, i.e. six zeros

C



$$h = \sqrt{100 - 16} \approx 9.17$$

$$V = \frac{1}{3} \pi (4)^2 \cdot (9.17) \\ \approx 153$$

A

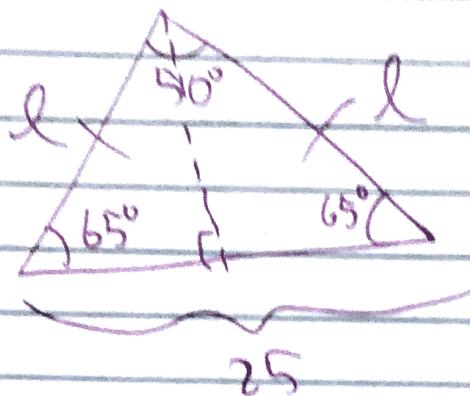
28. $d = \sqrt{(\Delta x)^2 + (\Delta y)^2}$

$$\Rightarrow \sqrt{(3\sqrt{3})^2 + (3\sqrt{5})^2} = \sqrt{27+45}$$

$$\approx 8.5$$

E

29.



$$\cos(65^\circ) = \frac{12.5}{l}$$

$$l = 29.58$$

Perimeter ≈ 58

[B]

30.

$$\text{cost} = 77.25 + 0.75 \lceil x \rceil$$

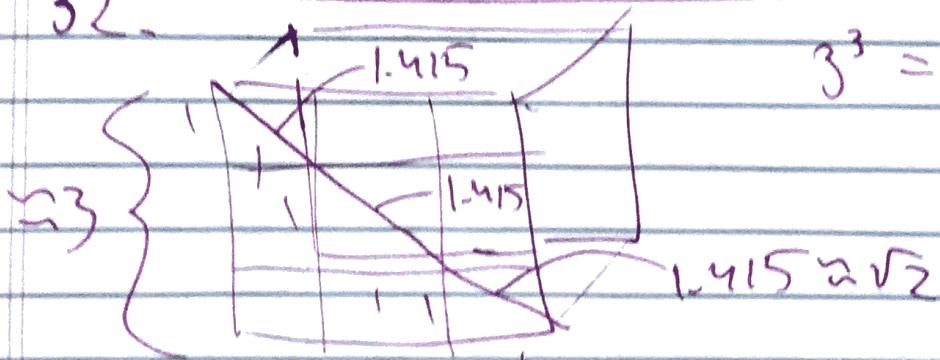
[B]

$$31. f(x,y) = \frac{x^2+y^2}{x^2-y^2}$$

$$f(x,-y) = \frac{x^2+y^2}{x^2-y^2} \quad (\text{even function})$$

[E]

32.



$$3^3 = 27$$

[D]

$$33. t, 8, 5, 4, 12, 8$$

 $\Rightarrow t=11$ works, [D]

$$\text{mean} = \frac{37+t}{6} = \text{median} = \begin{cases} < 8 \text{ if } t < 8 \\ \approx 8 \text{ if } t \geq 8 \end{cases}$$

34. $r = \cos(\theta)$
 \Rightarrow polar coords

$$(\cos\theta, \theta) \Rightarrow \left(\frac{1}{2}, \frac{\pi}{3}\right) = \left(\cos\frac{\pi}{3}, \frac{\pi}{3}\right)$$

works $\Rightarrow \boxed{B}$

35 - $n = p^3$

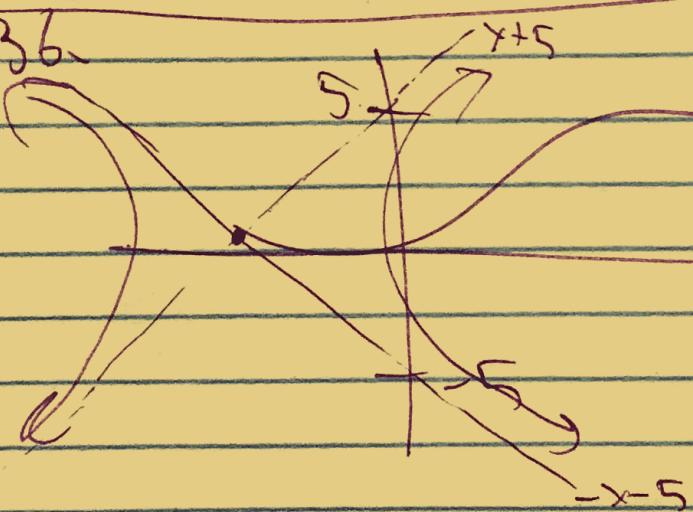
I is false since $p=2$ is allowed

II is true

III is false; one distinct factor

\boxed{B}

36.



$$x+5 = -x-5$$

$$10 = -2x$$

$$x = -5$$

$$y = 0$$

\boxed{B}

37.

1	30
2	$-\frac{3}{2}0$
3	$+\frac{1}{3}0$
4	$+8\frac{1}{6}0$
5	$+20$

30 is best

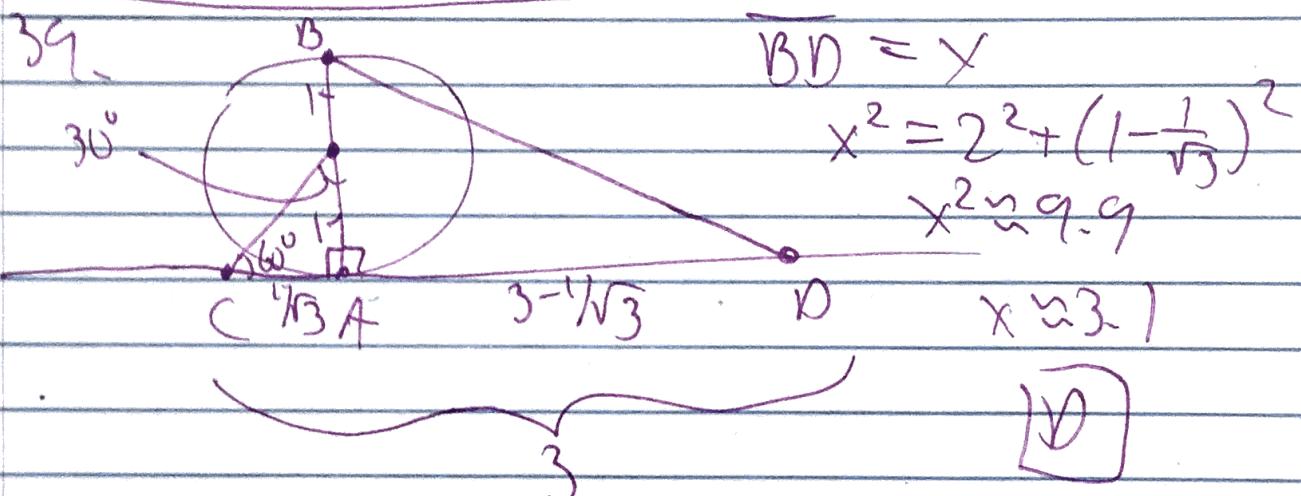
\boxed{A}

38. $n = 4k + 3$ for $n, k \in \mathbb{Z}$

$$3 \equiv -1 \pmod{4}$$

$$\Rightarrow n = 4t - 1, \boxed{C}$$

39.



40. $f(x) = e^x + x + k$

$$f(1.27) < 0, f(-1.28) > 0$$

~~$e^{1.27} + 1.27 + k < 0 < e^{-1.28} + (-1.28) + k$~~

$\underbrace{e^{1.27} + 1.27 + k}_{4.83} < 0 < \underbrace{e^{-1.28} + (-1.28) + k}_{-5.87}$

\boxed{D}

41. same amplitude \Rightarrow shift phase
 $\Rightarrow \boxed{C}$

42.

X	Y	X	Y
A	$14,000 - A$	θ	$B + 0.2A$

$\boxed{B} - 0.15B$

$$A+B = 14000$$

$$(0.8A + 0.15B) + (0.85B + 0.2A) = 14000$$

$$A_{\text{final}} = A$$

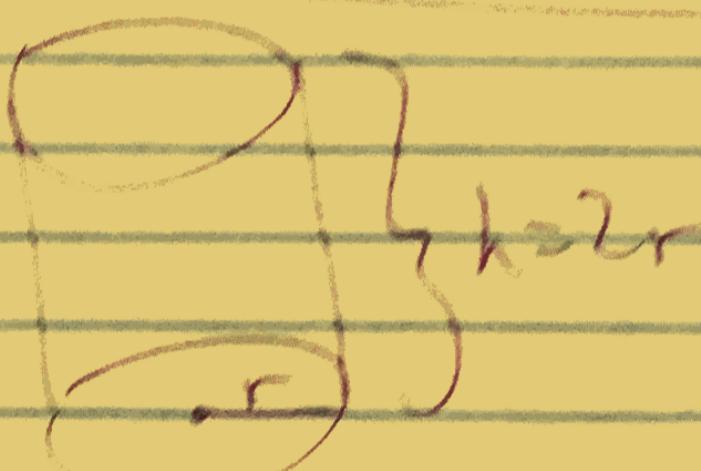
$$B_{\text{final}} = B$$

$$\Rightarrow 0.8A + 0.15(14000 - A) = A$$

$$\Rightarrow A = 6000, \quad \boxed{B}$$

43. $z^2 - (1-i)^2 = 1-2i-1 = -2i$
 \boxed{B}

44.



$$A = 2 \cdot (\pi r^2) + 2\pi r(2r)$$

$$= 2\pi r^2 + 4\pi r^2$$

$$= 6\pi r^2$$

\boxed{D}

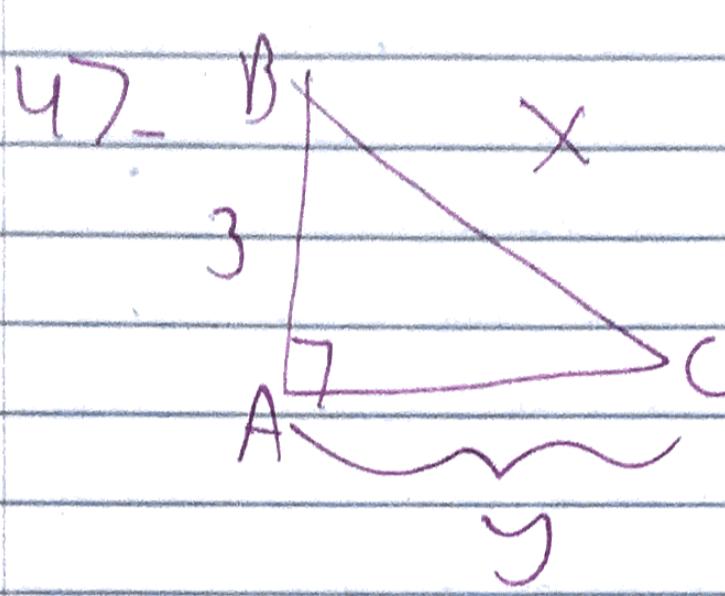
45. $270^\circ < \theta < 360^\circ$

$$\cos \theta = \frac{1}{\sin \theta} < 0, \sec \theta = \frac{1}{\cos \theta} > 0$$

\boxed{A}

46. Must be (C) or (D) since max exceeds 205 and 30.9 is too high \Rightarrow regress in Mathematica
 $\Rightarrow 22.1 \text{ ft is empirical max}$

$\Rightarrow \boxed{D}$

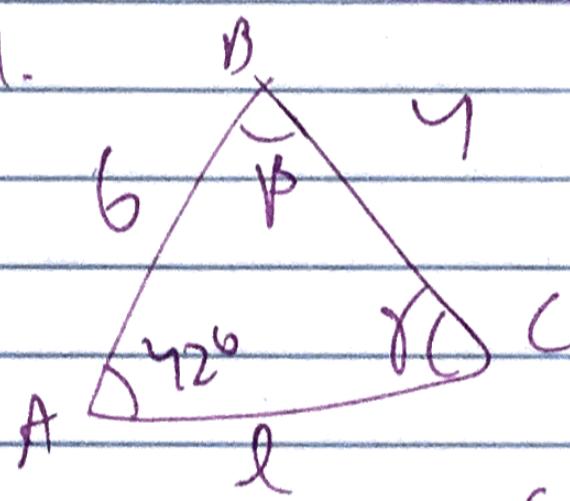
47. 

$$\sin(\alpha) = \frac{3}{x} \Rightarrow x = \frac{3}{\sin(\alpha)}$$

$$y = \sqrt{(3)^2 - x^2}$$

E

48. $f(4.7) = f(0.7) = 0.7$, C

49. 

Must be either (A), none, or (E), infinitely many.

Is RBS triangle consistent?

$$\frac{\sin(42^\circ)}{6} = \frac{\sin(\beta)}{l} = \frac{\sin(\gamma)}{b}$$

$\sin(\gamma) = 1.0037 > 1 \Rightarrow \text{NOPE, } \boxed{A}$

50. $y = Re^{cx}$, $y(0) = R = 1$, e^{10c} = 20

~~$y(10) = R e^{10c} = 20$~~

$y(t) = R e^{ct} = 200$

$e^{10c} = 20 \Rightarrow c \approx 0.3 \Rightarrow 200 = e^{0.3t}$

$\Rightarrow t = 17.66$ ~~17.66~~

From 20 mil to 200 mil takes $18 - 10 = 8$ years