1. The lowest score is from getting them all wrong (-30) and the highest is from getting them all right (120). The sum of these is 90. **B**

2. For any question that you answer, there's a 1/5 chance you earn 4 points and a 4/5 chance you earn -1 points. The expected score for any answered question would then be (1/5)(4) + (4/5)(-1) = 0. Since unanswered questions are also worth 0, the expected total score will be 0. **A**

3. It is easier to think of your score for this as 120 with -4 for each unanswered question and -5 for each wrongly-answered question. The lowest unobtainable score would then be the 120 minus the highest unobtainable combination of 4 and 5. The highest number that cannot be represented as a combination of 4's and 5's is (4)(5) - 4 - 5 = 11. Hence the lowest unobtainable score is 120-11=109. **C**

4. A score of 1 from 4 questions is 1 correct and 3 incorrect. The only lower score would be from 4 incorrect. The probability that you get all four incorrect is $(4/5)^4$. The probability that you get 1 correct and 3 incorrect is $(1/5)(4/5)^3$. Since there are 4 different questions you could get correct, the total probability is $(4/5)^4 + 4(1/5)(4/5)^3 = 512/625$. **D**

5. A score of 100 is obtained by either answering 25 correctly and leaving 5 unanswered, or 26 correct and 4 incorrect answers. The number of combinations of choosing 5 questions not to answer is 30C5. Similarly, the number of combinations of choosing 4 questions to answer incorrectly is 30C4. However, for *each* of the 4 incorrect questions, you can choose any of 4 answers, so the total number of combinations is 30C5 + 30C4 * 4 * 4 * 4 * 4 = 7,158,186. **D**

6. In order to find the oblique asymptote, divide x + 2 into $x^3 – 5x + 3$ and ignore the remainder. Performing the long division yields $x^2 – 2x – 1$. **C**

7. Square both sides of the equation to get (1+x) + (2-x) + 2√(1+x)(2-x) = 4 = 3 + 2√(1+x)(2-x). Hence √(1+x)(2-x) = (4-3)/2 = 1/2. **B**

8. A = 2. L = $\sqrt{(3^2 + 4^2)}$ = 5. P = $(i^4)^{502} = 1^{502}$ = 1. H = 1. Hence ALPHA = (2)(5)(1)(1)(2) = 20. **D**

9. Combining the logs gives you f(x) = $\log_2$(sin(x)cos(x)cos(2x)(cos(4x)). sin(x)cos(x) = sin(2x)/2. Therefore, f(x) = $\log_2$(1/2 * sin(2x)cos(2x)cos(4x)). Similarly, sin(2x)cos(2x) = sin(4x)/2, and therefore f(x) = $\log_2$(1/4 * sin(4x)cos(4x)) and similarly, f(x) = $\log_2$(1/8 sin(8x)). f(π/16) = $\log_2$(1/8 sin(π/2)) = $\log_2$(1/8) = -3. **B**

10. $2008331^2 - 2008329^2$ = (2008331-2008329)(2008331+2008329) = 2(4016660) = 8033320. **C**

11. f(1) = $(\sqrt{0} + 1)^2$ = 1. f(2) = $(\sqrt{1} + 1)^2$ = 4. f(3) = $(\sqrt{4} + 1)^2$ = 9. And you can see that f(n) = n^2. Hence, f(10) = 100. **C**

12. Since f(0)*f(1)*f(2) = f(1)*f(2)*f(3), you can see f(0)=f(3). Similarly, you can see f(3)=f(6) and, in general f(3n) = f(0). Also similarly, you can see f(3n+1)=f(1), and f(3n+2)=f(2). f(7)=f(1)=5, and f(15)=f(0)=2. Since f(0)*f(1)*f(2) = 30, f(2) = 3. Since f(38) = f(2), f(38) = 3. **B**

13. To start off, note f(x) and g(x), (and hence $f^{[n]}(x)$ and $g^{[n]}(x)$) are inverses of each other. We're given that $g^{[10]}(x) = h^{[15]}(0)$. Then take $h^{[10]}(g^{[10]}(x)) = h^{[10]}(h^{[15]}(0)) \rightarrow x = h^{[25]}(0)$. **A**

14. $100(1) + 99(2) + ... + 52(49) + 51(50) + 51(51) + 52(52) + \ldots + 99(99) + 100(100) =$
$100(101) + 99(101) + 98(101) + \ldots 52(101) + 51(101) = 101(100 + 99 + 98 + \ldots + 53 + 52 + 51) =$
$101(100 + 51)(50/2) = 101(151)(25)$. Evaluate this value mod 6. $(101)(151)(25) \equiv (5)(1)(1) \equiv 5 \pmod 6$ **D**

15. The first nine palindromic numbers are 1-9. The next nine are 11, 22, ..., 99. The 19th is 101, and the 20th is 111. **C**

16. $\sqrt{(9-x^2)} = \sqrt{[9 - (3\sin\theta)^2]} = \sqrt{[9 - 9\sin^2\theta]} = \sqrt{[9(1-1\sin^2\theta)]} = \sqrt{(9\cos^2\theta)} = 3|\cos\theta|$. **D**

17. π rad = 180 deg so 1 deg = $\pi/180$ rad. 300 deg = $300*\pi/180$ rad = $5\pi/3$ rad. **C**

18. Putting the right side under a common denominator, you can see $6-x = A(x+2) + B(x-2)$. Since this is true for all x, it's true for any specific x, like x=2. If x=2, then 4 = 4A and A=1. If x=-2, then 8 = -4B and B=-2. AB = (1)(-2) = -2. **A**

19. The slope between (3,14) and (3+h, f(3+h)) is $[f(3+h) - 14]/h = [(3+h)^2 + (3+h) + 2 - 14]/h$, which, after expanding, is $[(9 + 6h + h^2) + (3 + h) + 2 - 14]/h = (7h + h^2)/h = 7 + h$. As $h\to0$, the slope is 7. **C**

20. =====. The limit as $n\to\infty$ is $2/6 + 1/2 + 2/1 = 17/6$. **B**

21. GCF(p, $p + k$) = 1, unless p is equal to one of the prime factors of k, in which case GCF(p, $p + k$) = that particular prime factor of k. The largest prime factor of 66 is 11, so letting $p = 11$ gives GCF(11, 77) = 11. **E**

22. 2(2) + 3(-1) + 1(1) = 2. **B**

23. If the number does not look familiar to you, read it as $(1 + 1/1000)^{1000}$, which would come up in taking the limit of $(1 + 1/x)^x$ as $x\to\infty$, which is the number e. $(1001/1000)^{1000}$ is actually very close to e, which is about 2.7. This number is closest to 3. **C**

24. You could solve for the matrix **X**; however, it is simply easier to take the determinate of both sides, giving you det(**X**)*[(-1)(-4) - (2)(3)] = [(2)(0) - (8)(1)]. This is det(**X**)*(-2) = -8, and det(**X**) = 4. **D**

25. $y = 2\sin(\pi x - 3)\cos(\pi x - 3) = \sin(2\pi x - 6)$. This has amplitude 1. **A**

26. Writing -1 in polar form gives $e^{\pi i}$. $(-1)^{-i}$ is then $(e^{\pi i})^{-i} = e^{\pi}$. Then $(e^{\pi})^{1/\pi} = e$. **E**

27. What's inside the parentheses is clearly not 0 and seems reasonably finite (and, in fact, is equal to exactly $\pi^2/6$). So raising it to the 0th power gives 1. **A**

28. If Arccoth(2) = x, then coth(x) = 2. $\coth(x) = (e^x + e^{-x})/(e^x - e^{-x}) = 2$. And $e^x + e^{-x} = 2e^x - 2e^{-x}$. Bringing everything to one side gives $e^x - 3e^{-x} = 0$. Factoring e^{-x} out of the left side gives $e^{-x}(e^{2x} - 3) = 0$. Then, either $e^{-x} = 0$ or $e^{2x} - 3 = 0$. The first clearly cannot happen, and to solve the second one, say
$e^{2x} = 3$, $2x = \ln(3)$ and $x = 1/2 * \ln(3)$. **C**

29. Let x =. Since it is infinite, this is equivalent to saying x =. Solving this by squaring both sides and bringing everything to the left side gives $x^2 + x - 2 = 0$. The solutions to this are x=1 and x=-2. Since a squareroot cannot be negative, x=1. **B**

30. Factoring out the $\sec^2(15)$ gives $\sec^2(15)[1 + \cos(30)]$. Noting that 30 is twice 15, you can apply the double-angle formula to get $\sec^2(15)[1 + 2\cos^2(15) - 1] = \sec^2(15) * 2\cos^2(15) = 2$. (The two angles are, in fact, 15 and 30 radians, not degrees, but ultimately, this does not matter in the answer.) **C**