1. $(2 + i^{18})^{2008} = (2 + -1)^{2008} = 1^{2008} = 1$ **A**

2. $i^{13} + i^{29} - i^{2008} = i + i - (-1) = 2i - 1 = -1 + 2i$ **C**

3. $(2i+5) / (i-1) = (2i+5)(i+1) / (i^2 - (-1)^2) = 3-7i / -2 = -3/2 + 7i/2$

abs$(-3/2 + 7i/2)$ = sqrt $(9/4 + 49/4)$ = sqrt $(58/4)$ = sqrt $(29/2)$ **A**

4. $1 = \text{cis}(2\pi * k)$

1^$(1/6) = \text{cis}(2\pi * k / 6)$ so the possible angles are 0, $2\pi/6 = \pi/3$, $4\pi/6 = 2\pi/3$, $6\pi/6 = \pi$,

$8\pi/6 = 4\pi/3$ and $10\pi/6 = 5\pi/3$. The only answer choice that is not one of these is **A**

5. $(2i-3)^2 + (5+i) - (8-2i)(3i+4) = 5 - 12i + 5 + i - (38+16i) = -28-27i$ **A**

6. $z_1 = a+bi$, $z_2 = c+di$

$z_1+z_2 = (a+c) + (b+d)i = 3+ i$ $a + c = 3$ $b + d = 1$

z_1z_2(conj) $= (a+bi)(c-di) = (ac + bd) + (cb - ad)i$ $ac + bd = -18$ $cb - ad = 13$

The only choice satisfying the second set of conditions is **B**

7. Absolute value of $(3+i)(2i-2) / (4i+1)$ = abs $(-8+4i / 4i+1)$ = abs$(-8/17 - 36i/17)$ = sqrt$(1360)/17$

= 4sqrt85/17 **B**

8. $f(1-i) = 3(1- i)^2 - (1- i) + 41 = -6i - 1 + i + 41 = 40 - 5i$ **A**

9. $f(1) - f(i) = 43 - (-3 - i + 41) = 5 + i$ **C**

10. The range of i^x includes complex numbers, therefore none of the given choices are correct. **E**

11. $(11-23i) / (2i+6) = ½ - 4i$. $y = -4$, $x = 1/100$. $y/x = -400$ **D**

12. $\prod$ (k=1 to 10) i^{k-1} $= i$ ^ $(0+1+2+3+...+9) = i^{45} = i$ **A**

13. $(2i+7)^3 = 259 + 286i$ a/b = 0.905 **E** (closest to 1)

14. All 6 numbers are complex. Additionally, 3 of them are real. 6(7) + 3(5) = 57 **C**

15. Distance formula: d = sqrt $((7-4)^2 + (2- -11)^2)$ = sqrt$(3^2 + 13^2)$ = sqrt178 **A**

16. abs(6 – 2i) = sqrt($6^2 + 2^2$) = sqrt40 = 2sqrt10 **C**

17. $(2+i)^2$ – (i-3)(4+2i)i = (3 + 4i) - (2 – 14i) = 5 + 18i Im(z) = 18 (not 18i) **D**

18. (4+i) / (3i -1) = 1+13i / -10 **A**

19. 3i + sqrt27 = 3sqrt3 + 3i = 6 (sqrt3/2 + ½ i).r = 6, θ = arctan(1/sqrt3) = π/6 **D**

20. The shape is a triangle. Take the base as the vertical segment between (3, -1) and (3, 5) with length 6. The height is then the distance between the line x = 3 and the point (-2, 4). Area = (½)(6)(5) = 15 **C**

21. z = sqrt3 – i = 2cis(11π/6) $z^7 = 2^7$cis(5π/6) = 64i -64√3 **B**

22. This can be split up into two alternating series, one multiplied by i, or the same result can be obtained by simply plugging in the ratio i/2 into the formula for infinite geometric series. S = 1/(1-i/2) = 4/5 + 2i/5 **B**

23. The solution z = 0 should be obvious. After factoring this out and rewriting the equation slightly, we have $z^4 - (4-2i)z^3 + (2-8i)z^2 - (8-4i)z - 16i = 0$. The rational root theorem still holds, so the only possible real rational solutions are +/- 16, 8, 4, 2 and 1. Testing these will show that z = 4 is a solution, so factoring this out we can rewrite the function as $z^3 + (2i)z^2 - 2z - 4i = 0$, rearrange to $z^3 + 2z = -2iz - 4i$, factor out to obtain $z(z^2+2) = -2i(z^2+2)$ so we can see that z = -2i and $z^2 = -2$, neither of which add any real solutions. The only real solutions are z = 0 and z = 4. **C**

24. sin$i$ = $(1-e^2)/2ie$ $\sin^2 i = (e^4-2e^2+1) / -4e^2$ **E**

25. $(2+3i)^7$ -> 5th term = $({}_7C_4)(2)^3(3i)^4 = 35*8*81*i^4 = 22680$ **D**

26. $i^{14} = -1 = i^2$ **B**

27. 1/i = -i, so i^(1/i) = $i^{-i} = 1/i^i$. Using Euler's formula, we can find ln(-1) = iπ, and therefore

ln(i) = iπ/2, i*ln(i) = -π/2 = ln(i^i), i^i = e^(-π/2), i^{-i} = e^(π/2). **A**

28. ln($\log_i$ (e^(π/2))) = ln($\log_i$ (i^{-i}) according to the results above from #27. Hence, we have ln($\log_i$ (e^(π/2))) = ln(-i) = ln(i^3) = 3ln(i) = 3iπ/2 **C**

29. $e^{\wedge}(i\text{Arcsinx}) = 1$, $\ln(1) = i\text{Arcsinx}$, $0 = i\text{Arcsinx}$, $\text{Arcsinx} = 0$, $x = 0$ **E**

30. $e^{\wedge}(3i\pi/2) = (\ e^{\wedge}(\pi i/2)\ )^3 = i^3 = -i$ **B**