

①  $y = 3x^2 + bx + c$  *vertex formula*  
 $x = \frac{-b}{2(3)}$   
 $5 = 3(2)^2 - 12(2) + c$   
 $5 = -12 + c$   
 $17 = c$   
 $12 = -b$   
 $-12 = b$   
 $b + c = \boxed{5}$

②  $\left| \frac{x-3}{5x} \right| - 2 \left| \frac{x-2}{x-4} \right| = 57$   
 $x^2 - 15 - 2(4 - 2x^2) = 57$   
 $x^2 - 15 - 8 + 4x^2 = 57$   
 $5x^2 = 80$   
 $x^2 = 16$   
 $x = \pm 4$   
 $x = \boxed{4}$

③  $(8C4)(6C4)$   
 $70 \cdot 15$   
 $\boxed{1050}$

$2(3^3) + 3(3)^2 + k(3) + 15 = 0$   
 $36 + 9k = 0$   
 $k = -32$

$y = 2x^3 + 3x^2 - 32x + 15$   
 graph to get smallest  $x$  value  $x = \boxed{-5}$

④  $g(x) = 3x - 2$   $f(z) = z^3 + 2$   
 $4 = 3x - 2$   
 $z = x$   
 $\boxed{10}$

⑤  $x^2 + y^2 - 4x + 8y - 30 = 0$   
 $2x + 2y \frac{dy}{dx} - 4 + 8 \frac{dy}{dx} = 0$   
 $2(-3) + 2(1) \frac{dy}{dx} - 4 + 8 \frac{dy}{dx} = 0$   
 $10 \frac{dy}{dx} = 10$   
 $\frac{dy}{dx} = 1$   
 $y - 1 = 1(x + 3)$   
 $y = x + 4$

⑦ graph  $f(x)$   
 $x = \boxed{-1.322}$

⑧  $\frac{A}{2(x-3)} + \frac{B}{x-4} = \frac{27x-24}{(x^2-x-12)}$   
 $\frac{A}{2(x-3)} + \frac{B}{x-4} = \frac{27x-24}{6(x-4)(x+3)}$   
 $3A(x-4) + 6B(x+3) = 27x-24$   
 $3Ax - 12A + 6Bx + 18B = 27x - 24$   
 $(3A + 6B)x + (-12A + 18B) = 27x - 24$   
 $3A + 6B = 27 \quad -12A + 18B = -24$   
 $(A + 2B = 9) \rightarrow 2A + 4B = 18$   
 $-2A + 3B = -4 \quad \underline{2A + 3B = -4}$   
 $7B = 14$   
 $B = 2$   
 $A + 2(2) = 9$   
 $A = 5$   
 $\boxed{(5, 2)}$

⑨  $\log_2(\cos x) = -1$   
 $\cos x = 2^{-1}$   
 $\cos x = \frac{1}{2}$   
 $x = \frac{\pi}{3}, \frac{5\pi}{3}$   
 $\pi \leq x < 2\pi$

⑩ semi-major = 5  
 $a = 5$   
 foci  $(-5, 1)$  &  $(5, -7)$   
 center  $c = (-5, -3)$   
 $c =$  distance from center to foci  
 $c = 4$   
 $a^2 - b^2 = c^2$   
 $5^2 - b^2 = 4^2$   
 $-b^2 = -9$   
 $b = 3$

