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Round 1

Part 1 $\lim_{x \rightarrow 0} \frac{\sqrt{4-x} - 2}{x} \cdot \frac{\sqrt{4-x} + 2}{\sqrt{4-x} + 2} = \lim_{x \rightarrow 0} \frac{4-x-4}{x(\sqrt{4-x}+2)} = \frac{-1}{4} \quad A = \underline{\underline{-\frac{1}{4}}}$

Part 2

Find where $f'(x) = -4$ $f(2) = -3(4) + 8(2) - 1$
 $f'(x) = -6x + 8 = -4$ $-12 + 16 - 1 = 3$
 $-6x = -12$ $(2, 3) \quad B = \underline{\underline{5}}$
 $x = 2$

Part 3

$f(x) = \frac{(x+3)(x-3)}{(x+3)(x+4)}$ so VA @ $x = -4$ $C = \underline{\underline{-4}}$

Final $AC + B = -\frac{1}{4}(-4) + 5 = 1 + 5 = \underline{\underline{6}}$

Round 2

Part 1 $f(x) = \frac{x+3}{(x+3)(x+5)}$; $x \neq -3$ $f(-3) = \frac{1}{-3+5} = \frac{1}{2} \quad A = \underline{\underline{\frac{1}{2}}}$
 $k = \frac{1}{2}$

Part 2

$3^{\log_3 7} = x \quad x = 7 \quad B = \underline{\underline{7}}$

Part 3

$\begin{vmatrix} -3 & 2 \\ 1 & 5 \end{vmatrix} = -15 - 2 = -17$ $-3 \begin{vmatrix} -1 & 2 \\ 3 & 4 \end{vmatrix} = -6 \begin{vmatrix} -1 & 2 \\ 3 & 2 \end{vmatrix} + 9 \begin{vmatrix} -1 & 1 \\ 3 & 4 \end{vmatrix}$
 $C = \underline{\underline{-15 - 17 = -32}} \quad = -6(-8) + 9(1) = -15$

Final $A^B C = \left(\frac{1}{2}\right)^7 (-2^5) = -\frac{1}{2^2} = \underline{\underline{-\frac{1}{4}}}$

Round 3

Part 1

$s'(t) = -32t + 172 = v(t)$ $A = \underline{\underline{-20}}$
 $s'(6) = -192 + 172 = -20 \text{ ft/s}$

Part 2

$3 \int (4w^2 - w - 14) dw = 3 \left(\frac{4w^3}{3} - \frac{w^2}{2} - 14w \right) + C$
 $4w^3 - \frac{3}{2}w^2 - 42w + C \quad B = \underline{\underline{4}}$

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Round 3 Test values: $f(3) = -13$ $f(4) = 42 \Rightarrow$ between 3 and 4
 Part 3 $c = 12$

Final: $BC + A = 12(4) - 20 = \boxed{28}$

Round 4

Part 1

$$\begin{aligned} 2x + 2y y' &= 0 & m_{\text{normal}} &= 1/3 \\ 6 + 2y y' &= 0 & & \\ 2y y' &= -6 & & \\ y y' &= -3 = m_{\text{tangent}} & y - 1 &= \frac{1}{3}(x - 3) \end{aligned}$$

$A = \frac{1}{3}$

Part 2

$$\begin{aligned} \log_4 (x+12)(x-12) &= 4 \\ x^2 - 144 &= 4^4 = 256 \\ x^2 &= 400 \\ x &= \pm 20 \text{ reject } -20 \end{aligned}$$

$B = 20$

Part 3

$$\begin{aligned} \cos^2 x + \sin^2 x &= 2 \cos x & x &= \pi/3, 5\pi/3 \\ 1 &= 2 \cos x \\ \frac{1}{2} &= \cos x \end{aligned}$$

$C = 5\pi/3$

Final $12C(AB\pi)^{-1} = 12 \left(\frac{5\pi}{3} \right) \left(\frac{3}{20\pi} \right) = \boxed{3}$

Round 5

Part 1

$$\left. \frac{6x^3}{3} + \frac{4x^2}{2} - 2x \right|_{-1}^3 = 2(27) + 2(9) - 6 + 2 - 2 - 2$$

$A = 64$

Part 2

$$\frac{6!}{2!2!} = \frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2}{2 \cdot 2} = 180$$

$B = 180$

Part 3

$$\begin{aligned} f' &= 2x - \frac{2}{x^2} = 0 & f(1) &= 1 + 2 = 3 \\ 2x^3 - 2 &= 0 \\ x^3 - 1 &= 0 \\ x &= 1 \end{aligned}$$

$C = 3$

Final $B - C\sqrt{A} = 180 - 3\sqrt{64} = \boxed{156}$

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Round 6

Part 1 $S = \frac{a}{1-r} = \frac{1000}{1-\frac{7}{10}} = \frac{10000}{3} =$

A = 3

Part 2 $\frac{dx}{dt} = 3 \frac{dy}{dt} - 2y \frac{dy}{dt} = 3(3) - 2(2)(3) = 9 - 12 = -3$

speed = $\sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} = \sqrt{9+9} = \sqrt{18} = \underline{3\sqrt{2}} = B$

Part 3

$y = \cot^2(x^{1/2})$

$y' = -2 \cot \sqrt{x} (\csc^2 \sqrt{x}) \frac{1}{2\sqrt{x}} = -\frac{\cot \sqrt{x} \csc^2 \sqrt{x}}{\sqrt{x}} \quad \underline{C = 1}$

Final $B^{(A-C)} = (3\sqrt{2})^{3-1} = 9 \cdot 2 = \boxed{18}$

Round 7

Part 1

$y' = -16x^3 + 16x + 92 \Big|_{x=2} = -4$
 $y(2) = -4(16) + 8(4) + 184 = 152$
 $y - 152 = -4(x - 2)$
 $y = -4x + 8 + 152$
 $y = -4x + 160$

A = 156

Part 2

$S = 2500 + \sqrt{7,000,000} = 4500$
 $r(x) = 1000 + \sqrt{20(4500)} = 1300$

B = 1300

Part 3

$\frac{1}{2} \int_{\pi/2}^{\pi/4} \sin^2(2x) \cos 2x \cdot 2 dx$
 $= \frac{1}{2 \sin(2x)} \Big|_{\pi/2}^{\pi/4} = \frac{-1}{2 \sinh(\frac{\pi}{2})} + \frac{1}{2 \sinh \frac{\pi}{6}} \quad \underline{C = \frac{1}{2}}$

$= \frac{-1}{2} + 1 = \frac{1}{2}$

Final $C(B) - A = \frac{1}{2}(1300) - 156 = \boxed{494}$

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Round 8

Part 1 Domain $x \neq 0$ and $4-x \geq 0 \Rightarrow x \leq 4$

$$(-\infty, 0) \cup (0, 4]$$

$$\underline{A=4}$$

Part 2

$$f(x) = \ln x + \frac{1}{2} \ln(x^2+1)$$

$$f' = \frac{1}{x} + \frac{1}{2} \frac{(2x)}{(x^2+1)} \Big|_{x=2} = \frac{1}{2} + \frac{2}{5} = \frac{9}{10} \quad \underline{B=1}$$

Part 3

$$(\sin \theta + \cos \theta)^2 = (1.2)^2$$

$$\sin^2 \theta + 2 \cos \theta \sin \theta + \cos^2 \theta = 1.44$$

$$1 + \sin 2\theta = 1.44$$

$$\sin 2\theta = 0.44$$

$$\underline{C=0.44}$$

Final

$$\left(\frac{C}{A}\right)^B = \left(\frac{0.44}{4}\right)^1 = \boxed{0.11}$$

Round 9

$$\begin{array}{r} x+y^2=4 \\ -x-y=-2 \\ \hline y^2-2y=2 \end{array}$$

$$x+2=2 \quad x-1=2$$

$$x=0 \quad x=3$$

$$\underline{A=4}$$

Part 1

$$y^2-2y=2$$

$$(0, 2) \quad (3, -1)$$

$$y^2-y-2=0 \quad (y-2)(y+1) \Rightarrow 2, -1$$

Part 2

36 possible ways 6-6

15 times red > blue

$$p = \frac{15}{36} = \frac{5}{12}$$

$$\underline{B=7}$$

Part 3

$$f(2x+5) - g(3x+1)$$

$$3(2x+5)+1 - (2(3x+1)+5)$$

$$6x+15+1 - 6x-2-5 = 9$$

$$\underline{C=9}$$

Final $6A - 4B + C$

$$24 - 28 + 9 = \boxed{5}$$

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Round 10

Part 1 $g'(y) = \frac{1}{f'(x)} = \frac{1}{5x^4}$

$g'(0) \Rightarrow$
And $f(x) = 0$
 $x = -1$

So $g'(-1) = \frac{1}{5(-1)^4} = \frac{1}{5}$

$A = \frac{1}{5}$

Part 2 2nd - 1st 3rd - 2nd
 $x + 6 - 4x - 6 = 4x - 2 - x - 6$
 $-3x = 3x - 8$
 $6x = 8$ $x = \frac{4}{3}$

$B = \frac{4}{3}$

Part 3 $f(x) = 3x^5 - 10x^3$
 $f' = 15x^4 - 30x^2$
 $f'' = 60x^3 - 60x = 0$
 $60x(x^2 - 1) = 0$
 $x = 0$ $x = 1$ $x = -1$

$C = 3$

3 pts of reflection

Final: $C - \overset{A}{\left(\frac{1}{5}\right)} \overset{B}{\left(\frac{4}{3}\right)} = 3 - \frac{4}{15} = \boxed{\frac{41}{15}}$