AP Calculus AB/BC #1 Key 2025

1A) $\frac{1}{4}\int_0^4 C(t)\,dt \approx \underline{\underline{2.7782}}$ acres

1B) $C'(t) = \frac{C(4) - C(0)}{4 - 0}$

$\underline{\underline{t = 2.1542}}$ weeks

1C) $\lim_{t\to\infty}\left[\frac{38}{25+t^2}\right] = 0$

1D) $A(t) = C(t) - \int_4^t 0.1 \ln(x)\,dx$

$A'(t) = \frac{38}{25+t^2} - 0.1\ln(t)$

$A'(t) = 0$

$t = 11.4416998$

By candidates test

	t	A(t)
	4	5.128
*	11.4416	7.3169
	36	1.743

∴ Maximum occurs at either a critical point or endpoint. At $t = 11.442$ weeks is time $A(t)$ reaches a maximum value.

AP Calculus AB #2 2025

2A) $A_R = \int_0^3 [g(x) - f(x)]\,dx$

$A_R = 5.136619\ldots$

2B) $V = \int_0^3 [x[g(x) - f(x)]\,dx$

$V = 7.704929\ldots$

2C) $V = \pi \left[\int_0^3 (g(x)+2)^2 - (f(x)+2)^2 \right] dx$

2D) $f'(x) = 2x - 2$

$g'(x) = 1 + \pi \cos(\pi x)$

$f'(x) \stackrel{?}{=} g'(x)$

$x = 0.6758,\ 1.5,\ 2.32418$

$\therefore$ On $0 < x < 1$ $f'(x) = g'(x)$ at $x = 0.6758$

AP Calculus AB/BC # 3 2025

3A) $R'(1) = \frac{R(2)-R(0)}{2-0} = \frac{100-90}{2-0} = 5 \frac{\text{words}/\text{min}}{\text{min}}$

3B) Yes, there is a value for $0<c<10$ where $R(c)=155$, since $R(t)$ is continuous and differentiable, $f(8)=150$ and $f(10)=162$ therefore $f(c)=155$ on $8<c<10$.

3C) $\int_0^{10} R(t)dt = \left[\frac{(2-0)}{2}(90+100) + \left(\frac{8-2}{2}\right)(100+150) + \left(\frac{10-8}{2}\right)(150+162)\right]$

$= 190 + 3(250) + 312$

$= 190 + 750 + 312$

$= 1252$

3D) $\int_0^{10} \left(-\frac{3}{10}t^2 + 8t + 100\right) dt = -\frac{x^3}{10} + 4x^2 + 100x \Big]_0^{10}$

$= -100 + 400 + 1000$

$= 1300$ words.

$\therefore$ The teacher has read 1300 words in $0 \leq t \leq 10$ minutes

AP Calculus AB/BC #4 2025

4A) $g'(x) = f(x)$
$g'(8) = f(8) = 1$

4B) On $-6<x<12$, the graph of g has a point of inflection where the graph of f the derivative of g, changes from decreasing to increasing or vice versa. Therefore, the graph of g will have points of inflection at $x=-3$, $x=3$ and $x=6$.

4C) $g(12) = \int_6^{12} f(t)\,dt$
$g(12) = \frac{1}{2}(6)(3)$
$\underline{g(12) = 9}$

$g(0) = -\int_0^6 f(t)\,dt$
$g(0) = -\left[\frac{\pi}{2}(3)^2\right]$
$\underline{g(0) = -\frac{9\pi}{2}}$

4D) On $-6 \le x \le 12$ the absolute minimum value which g attains occurs at $x=0$.

x	$g(x)$
-6	0
0	$-9\pi/2$
6	0
12	9

AP Calculus AB #5 2025

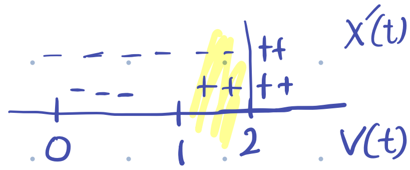
5A) $x_H(t) = e^{t^2-4t}$

$x_H'(t) = (2t-4)e^{t^2-4t}$

$\underline{x_H'(1) = (-2)e^{-3}}$

5B) $x_H'(t) = 0$ at $x = 2$

$v_J(t) = 0$ at $x = -1, 0, 1$



The particles H and J move in opposite directions where there velocities have opposite signs. On interval $1 < t < 2$ $x_H'(t) < 0$ and $v_J(t) > 0$.

5C) $v_J(2) = 2(2)[2^2-1]^3 > 0$ and $v_J'(2) > 0$

$v_J(2) > 0$ and $v_J'(2) > 0$, so the speed of the particle is increasing since the velocity and acceleration are both positive.

5D) $s_J(t) = s_J(0) + \int_0^2 2t(t^2-1)^3\,dt$

$s_J(0) = 7$

$u = t^2 - 1$

$du = 2t\,dt$

$t = 0 \quad u = -1$

$t = 2 \quad u = 3$

$s_J(2) = 7 + \int_{-1}^{3} u^3\,du$

$= 7 + \frac{1}{4}u^4\Big]_{-1}^{3}$

$= 7 + \frac{1}{4}(80)$

$\underline{s_J(2) = 27}$

AP Calculus AB #6 2025

6A) $y^3 - y^2 - y + \frac{1}{4}x^2 = 0$

$3y^2 y' - 2yy' - y' + \frac{1}{2}x = 0$

$\frac{dy}{dx}\left[3y^2 - 2y - 1\right] = -\frac{1}{2}x$

$$\frac{dy}{dx} = \frac{-x}{2(3y^2-2y-1)}$$

6B) $\left.\frac{dy}{dx}\right|_{(2,-1)} = \frac{-2}{2(3+2-1)} = \frac{-1}{4}$ at $(2,-1)$

Tangent line: $y = -1 - \frac{1}{4}(x-2)$

$y(1.6) = -1 - 0.25(1.6-2)$

$y(1.6) = -0.9$

6C) $3y^2 - 2y - 1 = 0$

$(3y+1)(y-1) = 0$

$y = -1/3,\ y = 1$

$\therefore$ For $x>0$ and $y>0$ point S has a vertical tangent line when $y=1$.

6D) $2xy + \ln y = 8$

$2x\frac{dy}{dt} + 2y\frac{dx}{dt} + \frac{1}{y}\frac{dy}{dt} = 0$

$2(4)\frac{dy}{dt} + 2(3) + \frac{dy}{dt} = 0$

$$\frac{dy}{dt} = \frac{-6}{9}$$