AP Calculus
Multiple Choice Monday #5

Name: Key
Date: ____________ Per: ____

Problem	Section Name
1. A side of a cube is measured to be 10 cm. Estimate the change in surface area of the cube when the side shrinks to 9.8 cm. (A) $+2.4\ cm^2$ (B) $-2.4\ cm^2$ (C) $-120\ cm^2$ (D) $+24\ cm^2$ (E) $-24\ cm^2$ Surface Area $= 6 \cdot \text{side}^2$ $A = 6s^2$ $dA = 12s\,ds$ $= 12(10)(-.2)$ $= -24$	12
2. $\frac{d}{dx}\left(\frac{x^3-4x^2+3x}{x^2+4x-21}\right) = \frac{d}{dx}\left(\frac{(x^2-x)\cancel{(x-3)}}{(x+7)\cancel{(x-3)}}\right)$ (A) $\frac{x^2-x}{x+7}$ (B) $\frac{x-1}{x-7}$ (C) $\frac{x^2-14x+7}{(x-7)^2}$ (D) $\frac{2x^2+13x-7}{(x+7)^2}$ (E) $\frac{x^2+14x-7}{(x+7)^2}$ $x^2-x \quad x+7$ $2x-1 \quad 1$ $\rightarrow \frac{(2x-1)(x+7)-(x^2-x)}{(x+7)^2} = \frac{2x^2+13x-7-x^2+x}{(x+7)^2}$ $= \frac{x^2+14x-7}{(x+7)^2}$	7
3. Find $\lim_{x\to 0} \frac{2x^3-3\sin x}{x^4}$ (A) -1 (B) $\frac{1}{2}$ (C) 0 (D) 1 (E) *Non existant* ← Since left + right do not agree $\frac{2(0)^3-3\sin(0)}{0^4} = \frac{0}{0}$ $= \lim_{x\to 0} \frac{6x^2-3\cos x}{4x^3} = \frac{6(0)^2-3\cos(0)}{4(0)^3} = \frac{-3}{0}$ ↙ Vert asymptote must look at $0^+, 0^-$ $\frac{-3}{0^+} \to -\infty$, $\frac{-3}{0^-} \to +\infty$	L'Hopital's Rule $\lim_{x\to 0} \frac{f(x)}{g(x)}$ $= \lim_{x\to 0} \frac{f'(x)}{g'(x)}$ for indeterminate limits
4. If $f(x) = e^{3x}$, then $f''(\ln 3) =$ (A) 9 (B) 27 (C) 81 (D) 243 (E) 729 $f'(x) = e^{3x} \cdot 3$ $f''(x) = e^{3x} \cdot 3 \cdot 3$ $f''(\ln 3) = 9e^{3\ln 3}$ $= 9e^{\ln 3^3} = 9\cancel{e^{\ln}}^{27} = 9 \cdot 27 = 243$	7

5. $\int_0^4 x^3 dx =$

(A) 16 (B) 32 (C) 48 (D) 56 (E) 64

$= \frac{x^4}{4}\Big]_0^4 = \frac{4^4}{4} - \frac{0^4}{4} = 4^3 - 0 = 64 - 0$

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*6. If the position of a particle is given by $x(t) = 2t^3 - 5t^2 + 4t + 6$, where $t > 0$. What is the distance traveled by the particle from $t = 0$ to $t = 3$?

(A) $\frac{1}{27}$ (B) $\frac{28}{27}$ (C) 20 (D) 21 (E) $\frac{569}{27}$

$\int |v(t)|\, dt$

$v(t) = 6t^2 - 10t + 4$

$\int_0^3 |6t^2 - 10t + 4|\, dt = 21.07407$

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*7. The average value of the function $f(x) = \ln^2 x$ on the interval $[2, 4]$ is

(A) -1.204 (B) 1.204 (C) 2.159 (D) 2.408 (E) 8.636

$\frac{1}{b-a}\int_a^b f(x)\, dx \rightarrow \frac{1}{4-2}\int_2^4 (\ln x)^2\, dx$

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*8. If $f(x)$ is continuous and differentiable and $f(x) = \begin{cases} ax^4 + 5x, & x \le 2 \\ bx^2 - 3x, & x > 2 \end{cases}$, then $b =$

(A) 0.5 (B) 0 (C) 2 (D) 6 (E) There is no value of b

$f'(x) = \begin{cases} 4ax^3 + 5 & x < 2 \\ 2bx - 3 & x > 2 \end{cases}$

$a(2)^4 + 5(2) = b(2)^2 - 3(2)$

$16a + 10 = 4b - 6$

$4a(2)^3 + 5 = 2b(2) - 3$

$32a + 5 = 4b - 3$

menu → algebra → Solve System → SolveSystem → variable a, b
3 7 1

$\text{Solve}\left(\begin{cases} 16a + 10 = 4b - 6 \\ 32a + 5 = 4b - 3 \end{cases}, \{a, b\}\right)$

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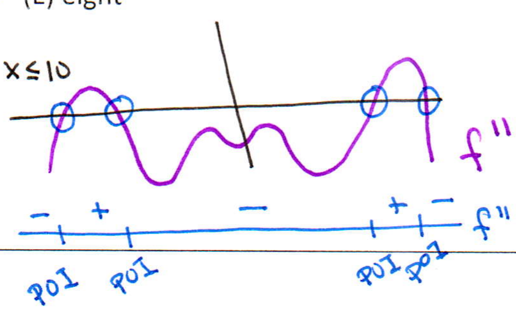
*9. The second derivative of a function f is given by $f''(x) = x \sin x - 2$. How many points of inflection does f have on the interval $(-10, 10)$?

(A) zero (B) two (C) four (D) six (E) eight

$f1(x) := x \sin x - 2 \mid -10 \le x \le 10$

→ graph



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