AP CALCULUS AB – AP REVIEW 2

Work the following on notebook paper, showing all work. Use your calculator only on problems 13, 20, and 22.

13. (Calc) A particle moves along the x-axis with velocity at time $t \geq 0$ given by $v(t) = -1 + e^{1-t}$.

(a) Find the acceleration of the particle at time $t = 3$.
(b) Is the speed of the particle increasing at time $t = 3$? Give a reason for your answer.
(c) Find all values of t at which the particle changes direction. Justify your answer.
(d) Find the total distance traveled by the particle over the time interval $0 \leq t \leq 3$.

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14. If $f(x) = x\sqrt{2x-3}$, then $f'(x) =$

(A) $\dfrac{3x-3}{\sqrt{2x-3}}$ (B) $\dfrac{x}{\sqrt{2x-3}}$ (C) $\dfrac{1}{\sqrt{2x-3}}$ (D) $\dfrac{-x+3}{\sqrt{2x-3}}$ (E) $\dfrac{5x-6}{2\sqrt{2x-3}}$

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15. If $\int_a^b f(x)\,dx = a + 2b$, then $\int_a^b \left(f(x) + 5\right)dx =$

(A) $a + 2b + 5$ (B) $5b - 5a$ (C) $7b - 4a$ (D) $7b - 5a$ (E) $7b - 6a$

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16. $\dfrac{d}{dx}\left[\cos^2\left(x^3\right)\right] =$

(A) $6x^2 \sin\left(x^3\right)\cos\left(x^3\right)$ (B) $6x^2 \cos\left(x^3\right)$ (C) $\sin^2\left(x^3\right)$

(D) $-6x^2 \sin\left(x^3\right)\cos\left(x^3\right)$ (E) $-2\sin\left(x^3\right)\cos\left(x^3\right)$

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17. An equation of the line tangent to the graph of $y = \cos(2x)$ at $x = \dfrac{\pi}{4}$ is

(A) $y - 1 = -\left(x - \dfrac{\pi}{4}\right)$ (B) $y - 1 = -2\left(x - \dfrac{\pi}{4}\right)$ (C) $y = 2\left(x - \dfrac{\pi}{4}\right)$

(D) $y = -\left(x - \dfrac{\pi}{4}\right)$ (E) $y = -2\left(x - \dfrac{\pi}{4}\right)$

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18. Let f be a function defined for all real numbers x. If $f'(x) = \dfrac{\left|4 - x^2\right|}{x - 2}$, then f is decreasing on the interval

(A) $(-\infty, 2)$ (B) $(-\infty, \infty)$ (C) $(-2, 4)$ (D) $(-2, \infty)$ (E) $(2, \infty)$

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19. Let f be a differentiable function such that $f(3) = 2$ and $f'(3) = 5$. If the tangent line to the graph of f at $x = 3$ is used to find an approximation to a zero of f, that approximation is

(A) 0.4 (B) 0.5 (C) 2.6 (D) 3.4 (E) 5.5

20. (Calc) For $0 \le t \le 31$, the rate of change of the number of mosquitoes on Tropical Island at time t days is modeled by $R(t) = 5\sqrt{t}\cos\left(\frac{t}{5}\right)$ mosquitoes per day. There are 1000 mosquitoes on Tropical Island at time $t = 0$.

(a) Show that the number of mosquitoes is increasing at time $t = 6$.

(b) At time $t = 6$, is the number of mosquitoes increasing at an increasing rate, or is the number of mosquitoes increasing at a decreasing rate? Give a reason for your answer.

(c) According to the model, how many mosquitoes will be on the island at time $t = 31$? Round your answer to the nearest whole number.

(d) To the nearest whole number, what is the maximum number of mosquitoes for $0 \le t \le 31$? Show the analysis that leads to your conclusion.

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21. $\int_0^{\pi/3} \sin(3x)\,dx =$

(A) -2 (B) $-\frac{2}{3}$ (C) 0 (D) $\frac{2}{3}$ (E) 2

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22. (Calc)

x	0	0.5	1.0	1.5	2.0
$f(x)$	3	3	5	8	13

A table of values for a continuous function f is shown above. If four equal subintervals of [0, 2] are used, which of the following is the trapezoidal approximation of $\int_0^2 f(x)\,dx$?

(A) 8 (B) 12 (C) 16 (D) 24 (E) 32

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23. $\int_1^2 \frac{1}{x^3}\,dx =$

(A) $-\frac{7}{8}$ (B) $-\frac{3}{4}$ (C) $\frac{15}{64}$ (D) $\frac{3}{8}$ (E) $\frac{15}{16}$

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24. If $y = \frac{3}{4+x^2}$, then $\frac{dy}{dx} =$

(A) $\frac{-6x}{\left(4+x^2\right)^2}$ (B) $\frac{3x}{\left(4+x^2\right)^2}$ (C) $\frac{6x}{\left(4+x^2\right)^2}$ (D) $\frac{-3}{\left(4+x^2\right)^2}$ (E) $\frac{3}{2x}$

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25. The function defined by $f(x) = x^3 - 3x^2$ for all real numbers x has a relative maximum at $x =$?

(A) -2 (B) 0 (C) 1 (D) 2 (E) 4

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26. $\frac{d}{dx}\left(\frac{1}{x^3} - \frac{1}{x} + x^2\right)$ at $x = -1$ is

(A) -6 (B) -4 (C) 0 (D) 2 (E) 6