AP Calculus AB Unit Test
"Applications of Derivatives"

Name Sammit {#1 calc

Form A

Multiple Choice (calculator –active section)

1. Find all extrema in the interval $[0, 2\pi]$ if $y = x + \sin x$

(a) $(-1, -1+\frac{3\pi}{2})$, (0, 0) (b) $(2\pi, 2\pi)$, (0, 0) (c) $(2\pi, 2\pi)$, (π, π)

(d) (π, π), (0, 0) (e) none of these

2. Find all open intervals on which the function $f(x) = \frac{x}{x^2+x-2}$ is decreasing

(a) $(-\infty, \infty)$ (b) $(-\infty, 0)$ (c) $(-\infty, -2)$ and $(1, \infty)$

(d) $(-\infty, -2)$, $(-2, 1)$ and $(1, \infty)$ (e) none of these

3. A farmer has 160 feet of fencing to enclose 2 adjacent rectangular pig pens. What dimensions should be used so that the enclosed area will be a maximum ?

(a) $4\sqrt{15}$ ft by $\frac{8}{5}\sqrt{15}$ ft (b) 40 ft by $\frac{80}{3}$ ft (c) 20 ft by $\frac{80}{3}$ ft

(d) 40 ft by 40 ft (e) none of these

4. Given that $f(x) = -x^2 + 12x - 28$ has a relative maximum at x = 6, choose the correct statement

(a) f' is negative on the interval $(-\infty, 6)$ (b) f' is positive on the interval $(-\infty, \infty)$

(c) f' is negative on the interval $(6, \infty)$ (d) f' is positive on the interval $(6, \infty)$

(e) none of these

5. Find the point on the graph of $y = \sqrt{x+1}$ closest to the point (3,0)

(a) (0 , 1) (b) $\left(\frac{5}{2}, \sqrt{\frac{7}{2}}\right)$ (c) (3 , 2) (d) $(2, \sqrt{3})$

(e) none of these

6. Given the function $f(x) = e^{\frac{x}{2}}$ on the closed interval [-1 , 4] , if c is the number guaranteed by the mean value theorem, then c (correct to three decimal places) is approximately

(a) 0.998 (b) 1.163 (c) 1.996 (d) 2.065 (e) 2.325

7. A particle moves in a straight line such that its distance at time t from a fixed point on the line is given by $8t - 3t^2$ units. What is the total distance covered by the particle from t =1 to t =2 ?

(a) 1 unit (b) $\frac{4}{3}$ units (c) $\frac{5}{3}$ units (d) 2 units (e) 5 units

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Name_____
Form A

Multiple Choice (non-calculator section)

1. Find all critical numbers for the function $f(x)=(9-x^2)^{\frac{3}{5}}$

(a) 0 (b) 3 (c) -3, 3 (d) -3, 0, 3 (e) none of these

(1) $f'(x)=\frac{3}{5}(9-x^2)^{-2/5}\cdot -2x=0$

$(9-x^2)^{-2/5}\cdot -2x=0$

$9-x^2=0 \quad -2x=0$

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

2. Find the values of x that give relative extrema for the function $f(x)=(x+1)^2(x-2)$

(a) rel. max: x = -1; rel. min: x = 1 (b) rel. max x =1, x = 3; rel. min x = -1
(c) rel. min x = 2 (d) rel. max x = -1; rel. min x = 2 (e) none of these

$(x^2+2x+1)(x-2)=x^3-2x^2+2x^2-4x+1x-2$

$x^3-3x-2=f(x)$

$f'(x)=$

$3x^2-3=0$

$x=\pm 1$

+ | − | +

-1 max 1 min

3. Let $f''(x)=3x^2-4$ and let f(x) have critical numbers -2, 0, and 2. Use the Second Derivative Test to determine which critical numbers, if any, gives a relative minimum

(a) -2 (b) 2 (c) 0 (d) -2 and 2 (e) none of these

$f''(-2)=8 \cup$

$f''(0)=-4 \cap$

$f''(2)=8 \cup$

4. Find all points of inflection: $f(x)=\frac{1}{12}x^4-2x^2+15$

(a) (2,0) (b) (2,0) , (-2,0) (c) (0,15) (d) $(2,\frac{25}{3})$, $(-2,\frac{25}{3})$

(e) none of these

$f'(x)=\frac{1}{3}x^3-4x$

$f''(x)=x^2-4=0$

$x=2,-2$

f''(x) | − | + | +

-2 2 x

5. State why Rolle's Theorem does not apply to the function $f(x)=\frac{2}{(x+1)^2}$ on the interval [-2,0]

(a) f is not continuous on [-2,0] (b) f(-2) ≠ f(0)
(c) f is not differentiable at x = -1 (d) Both a and c
(e) none of these

6. Let f(x) be a polynomial function such that f(-2) = 5, f '(-2) = 0, and f "(-2) = 3 . The point (-2 , 5) is a_____of the graph of f

(a) relative maximum (b) relative minimum (c) intercept
(d) point of inflection (e) none of these

cc↑

7. If $V=\frac{4}{3}\pi r^3$, what is $\frac{dV}{dr}$ when r = 3 ?

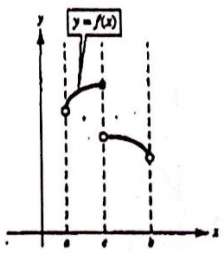
(a) 4π (b) 12π (c) 24π (d) 36π (e) 42π

$\frac{dV}{dr}=4\pi r^2$

$4\pi(3)^2$

8. Determine from the graph whether *f* possesses extrema on the interval (*a*, *b*).

(a) Maximum at $x = c$, minimum at $x = b$
(b) Maximum at $x = c$, no minimum
(c) No maximum, minimum at $x = b$
(d) No extrema
(e) None of these



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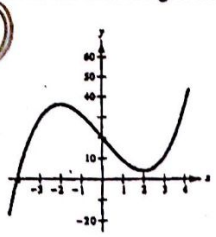
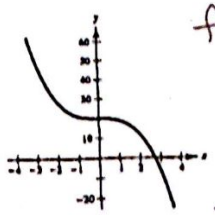
9. Which of the following is the correct sketch of the graph of the function $y = x^3 - 12x + 20$?

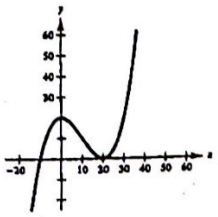
(a) 

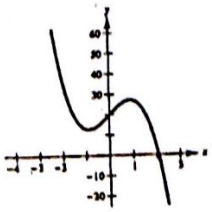
(b) 

$f'(x) = 3x^2 - 12 = 0$
$3(x^2 - 4) = 0$
$x = \pm 2$

$f''(x) = 6x$

$f''(2) = 12$ ∪
$f''(-2) = -12$ ∩

(c) 

(d) 

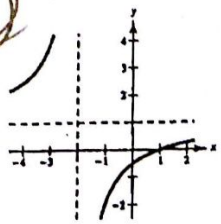
(e) None of these

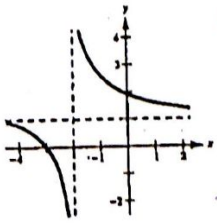
10. Which of the following is the correct sketch of the graph of the function $f(x) = \frac{x-1}{x+2}$?

HA $y = 1$

$x = 0$
$\frac{0-1}{0+2} = -\frac{1}{2}$

VA $x = -2$

(a) 

(b) 

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

$f''(x) = \frac{-6x - 12}{(x+2)^4} = 0$

$x = 2$
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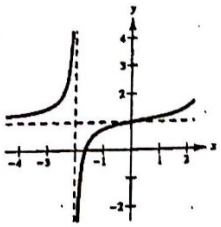
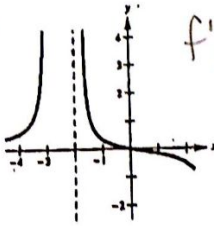
(c) 

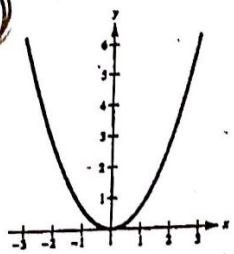
(d) 

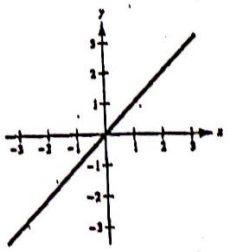
$f'(x) = \frac{3}{(x+2)^2}$

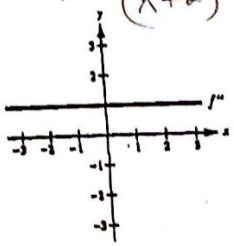
$f''(x) = \frac{(x+2)^2(0) - 3(2(x+2))}{(x+2)^4}$

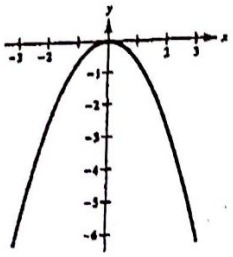
(e) None of these

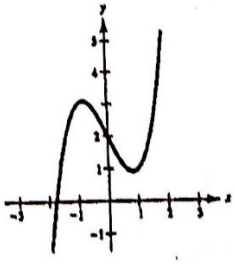
11. The figure given in the graph is the second derivative of a polynomial function, f. Choose a graph of f.

(a) 

(b) 



(c) 

(d) 

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