AP Calculus – Another Review for Ch 4 - All

1. For $0 \le t \le 30$, the rate of change of the number of flies on Coral Island at time t days is modeled by $F(t) = 2\cos\left(\frac{\pi}{t}\right) - 8\sqrt{t+1}$ flies per day.

a) Is the number of flies increasing or decreasing at time $t = 3$? Decreasing, Slope = (−) $F'(3) = (-)$

b) At time $t = 3$, is the number of flies increasing at an increasing rate, increasing at a decreasing rate, decreasing at an increasing rate, or decreasing at a decreasing rate? Give a reason for your answer.

*think vel & accel

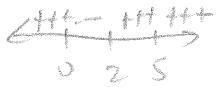
*see back $F'(3) = (-)$ $F''(3) = (-)$ decreasing @ increasing rate

2. A rectangular field is to be bounded by a fence on three sides and by a building on the fourth side. Find the maximum area that can be enclosed with 2500 feet of fence. *see below

3. Let f be a function with a second derivative given by $f''(x) = x^3(x-2)(x-5)^2$. What are the x-coordinates of the points of inflection of the graph of f?

(A) 0 only (B) 2 only (C) 0 and 2 only (D) 2 and 5 only (E) 0, 2, and 5

possible = 0, 2, 5



4. Let g be the function given by $g(x) = x(x-2)^2$. The graph of g is concave down when

(A) $x > \frac{4}{3}$
(B) $x < \frac{4}{3}$
(C) $x > \frac{3}{2}$
(D) $x < \frac{3}{2}$
(E) $x < 2$

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

$g'(x) = 3x^2 - 8x + 4$

$g''(x) = 6x - 8 = 0$

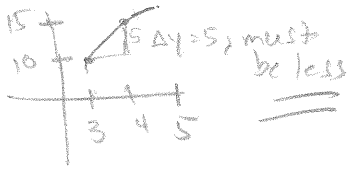
$x = \frac{8}{6} = \frac{4}{3}$ ← Inflection

5. Let f be a twice-differentiable function with $f'(x) > 0$ and $f''(x) < 0$ for all real numbers x, such that $f(3) = 10$ and $f(4) = 15$. Of the following, which is a possible value for $f(5)$?

(A) 12
(B) 15
(C) 18
(D) 20
(E) 22

$f'(x) > 0$ Increasing

$f''(x) < 0$ decreasing rate



6. If f is continuous for $a \le x \le b$ and differentiable for $a < x < b$, which of the following could be false?

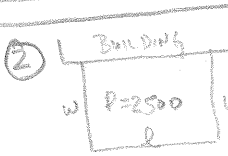
(A) f has a maximum value on $a \le x \le b$
(B) f has a minimum value on $a \le x \le b$
(C) f has no corners, cusps, or vertical tangent lines on $a \le x \le b$
(D) $f'(c) = \frac{f(b) - f(a)}{b - a}$ for some c such that $a < c < b$
(E) $f'(c) = 0$ for some c such that $a < c < b$ ← assumes levels off

7. If $f''(x) = 3x(x+3)(x-1)^2$, then the graph of f has inflection points when $x =$

(A) -3 only
(B) 1 only
(C) -3 and 1 only
(D) 0 and -3 only
(E) -3, 0, and 1 only

$x = 0, -3, 1$

(2)



$A = lw$ $P = 2w + l = 2500$ MAX

$l = 2500 - 2w$

$A = (2500 - 2w) \cdot w$

$A = 2500w - 2w^2$ $A(w) = \text{MAX, SO}$

$0 \le w \le 1250$ $A(0) = 0$

$A' = 2500 - 4w$ $A(625) = 781250$

$0 = 2500 - 4w$ $A(1250) = 0$

$w = 625$

Increasing @ Constant rate

$f'(x) > 0$

$f''(x) = 0$

Decreasing @ Const. rate

$f'(x) < 0$

$f''(x) = 0$

Increasing @ Increasing Rate

$f'(x) > 0$

$f''(x) > 0$

* slope of tan below graph

Increasing @ Decreasing Rate

$f'(x) > 0$

$f''(x) < 0$

* slope of tan above graph

Decreasing @ decreasing rate

$f'(x) < 0$

$f''(x) > 0$

* slop of tan below

Decreasing @ Increasing rate

$f'(x) < 0$

$f''(x) < 0$

* slop of tan above