

Unit 4 - End of Unit Review

Calc. AB/BC

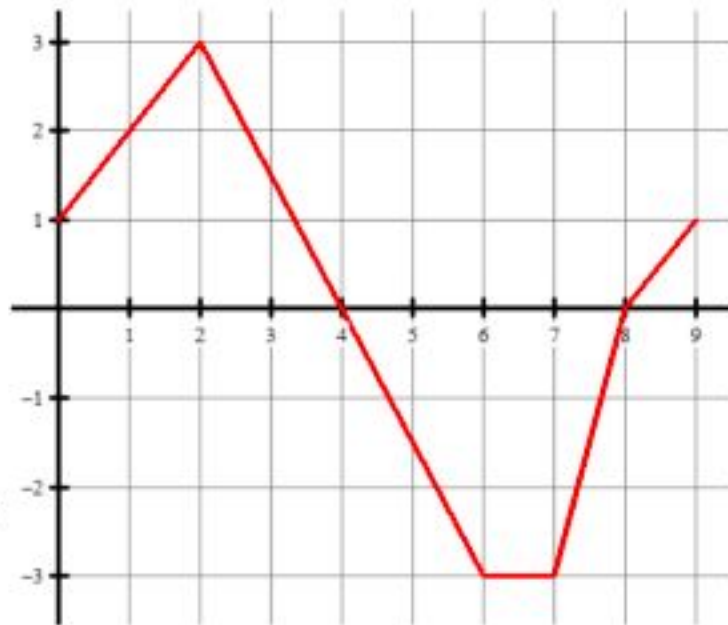
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Unit 4 REVIEW – Contextual Application of Differentiation

Reviews do NOT cover all material from the lessons but should remind you of key points. To be prepared, you should review all packets from Unit 4.

1. The figure shows the velocity $v = \frac{ds}{dt} = f(t)$ of a body moving along a coordinate line in meters per second.

- When does the body reverse direction?
- When is the body moving at a constant speed?
- What is the body's maximum speed?
- At what time interval(s) is the body slowing down?



Find the following. Use L'Hospital's when possible.

2. $\lim_{x \rightarrow 2} \frac{x-2}{x^2-7x+10}$

3. $\lim_{x \rightarrow 0} \frac{3x^2}{e^x-1-x}$

4. $\frac{d}{dx} \frac{3x-2}{5x+1}$

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5. If the length l of a rectangle is decreasing at a rate of 2 inches per minute while its width w is increasing at a rate of 2 inches per minute, which of the following must be true about the area A of the rectangle?

- (A) A is always increasing. (B) A is always decreasing. (C) A is increasing only when $l > w$.
(D) A is increasing only when $l < w$. (E) A remains constant.

The following problems are calculator active.

6. Brust is riding his bicycle north away from an intersection at a rate of 15 miles per hour. Sully is driving his car towards the intersection from the west at a rate of 30 miles per hour. If Brust is 0.4 miles from the intersection, and Sully is 1 mile from the intersection, at what rate is the distance between the two of them increasing or decreasing?

7. The side of a cube is increasing at a constant rate of 0.2 centimeters per second. In terms of the surface area S , what is the rate of change of the volume of the cube, in cubic centimeters per second?

(A) $0.1S$

(B) $0.2S$

(C) $0.6S$

(D) $0.04S$

(E) $0.008S$

8. The function $f(x) = (1 - \sin x)^2$ is concave up at $x = \frac{\pi}{6}$?

a. What is the estimate for $f(0.5)$ using the local linear approximation for f at $x = \frac{\pi}{6}$?

b. Is it an underestimate or overestimate? Explain.

Notes Filled In:

AP Calc. AB/BC - End of Unit Review - Filled In

Name: _____ Date: _____

Unit 4 CA – Contextual Application of Differentiation

1. The position of a particle moving along a coordinate line is $s(t) = 2t^3 - 6t$, with s in meters and t in seconds. Find the particle's velocity and acceleration at $t = 6$.

info (Option + →)

Find the following. Use L'Hospital's when possible.

2. $\lim_{x \rightarrow 0} \frac{x^2}{1 - \cos(3x)}$

3. $\lim_{x \rightarrow 4} \frac{x^2 + 6x - 40}{4 - x}$

4. $\lim_{x \rightarrow 3} \frac{x^2 - 2x + 1}{x - 3}$

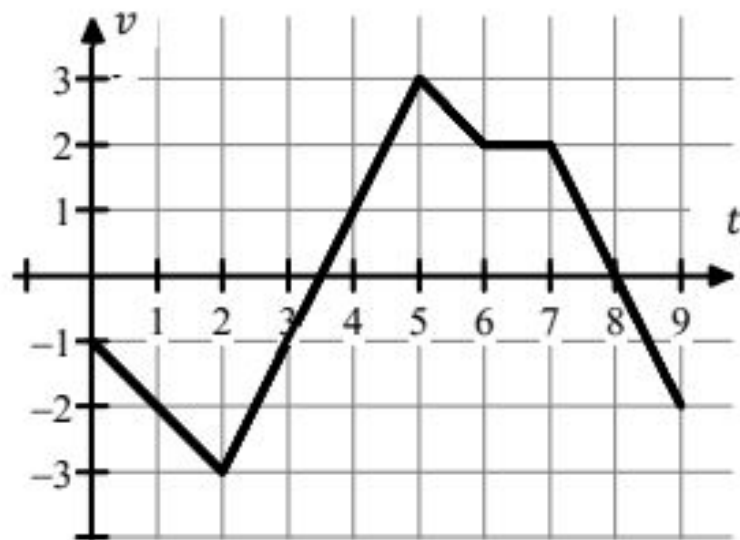
5. The figure shows the velocity v of a body moving along a coordinate line in meters per second.

a) When does the body reverse direction?

b) When is the body moving at a constant speed?

c) What is the body's maximum speed?

d) At what time interval(s) is the body slowing down?



6. A rocket lifts off at the Kennedy Space Center in Florida. A camera is placed 2000 feet away from the launch pad to film the rocket's ascent. The height of the rocket can be found using $s(t) = 50t^2$, where s is feet and t is seconds. Find the rate of change in the angle of elevation of the camera at 10 seconds after lift-off.

7. Two roads cross at right angles, one running north/south and the other east/west. Eighty feet south of the intersection is an old radio tower. A car traveling at 50 feet per second passes through the intersection heading east. At how many feet per second is the car moving away from the radio tower 3 seconds after it passes through the intersection?

(A) 43.65

(B) 44.12

(C) 44.59

(D) 56.67

(E) 81.76

8. The function $f(x) = -xe^x + 2$ is concave down at $x = 0$.
- Find the tangent line of f at $x = 0$.
 - What is the estimate for $f(-0.1)$ using the local linear approximation for f at $x = 0$?
 - Is it an underestimate or overestimate? Explain.

Unit 4 Corrective Assignment – Answers

1. $s'(6) = 210$ meters / sec $s''(6) = 72$ meters / sec ²	2. $\frac{2}{9}$	3. -14	4. Does not exist	5a. $t = 3.5$ and $t = 8$ 5b. $(6, 7)$ 5c. 3 meters / sec 5d. $(2, 3.5)$, $(5, 6)$ and $(7, 8)$
6. Setup: $\tan \theta = \frac{1}{2000} s$ Answer: 0.0689 radians per second	7. B	8a. $y = -x + 2$ 8b. $f(-0.1) \approx 2.1$ 8c. Overestimate because $f(x)$ is concave down.		