

Study guide for Exam 2 Math 170 - Sestini

1. Two sides of a triangle are 4m and 5m in length and the angle between them is increasing at the rate of 0.04 rad/sec. How fast is the area of the triangle changing when the angle between the sides of fixed length is $\pi/5$?

2. The diameter of a sphere is measured to be 8.4 cm with an error of ± 0.006 cm. Find the maximum error in computing the volume of the sphere.

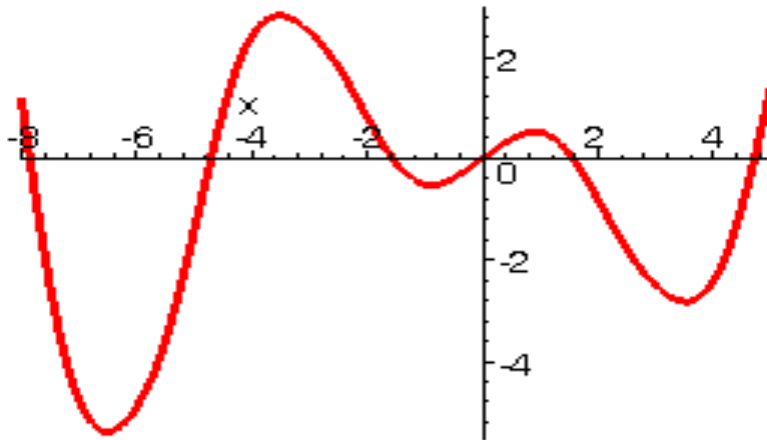
3. If both f and g are concave upward, under what conditions will the composite function $f(g(x))$ be concave upward?

4. A number a is called a fixed point of a function $f(x)$ if $f(a) = a$. Prove that if $f'(x) \neq 1$ for all real numbers x , then f has at most one fixed point.

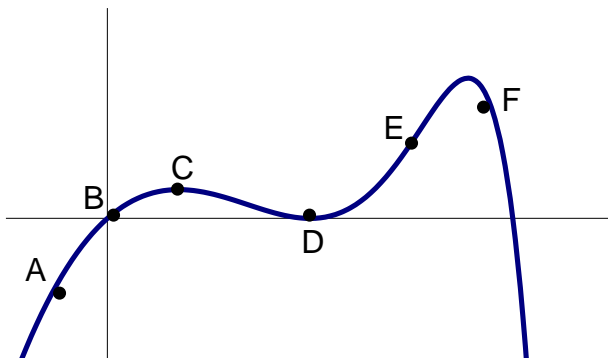
5. a) Carefully state the Mean Value Theorem

b) Use a ruler to estimate all values of c which satisfy the conclusion of the Mean Value Theorem for the function graphed below on the interval $[-6, 2]$

$c =$ _____



6. Determine the signs of $f(x)$, $f'(x)$, and $f''(x)$ for the graph below at the indicated points.



	A	B	C	D	E	F
$f(x)$						
$f'(x)$						
$f''(x)$						

Study guide for Exam 2 Math 170 - Sestini

Part II. No calculator of any type may be used on this part of the exam.

1. True/False fill in the blank:

- a) True or False: If f has a local maximum at $x = c$, then c is a critical point of f
- b) True or False: If f is increasing on an interval I , then $1/f(x)$ is decreasing on I
- c) If f is concave up on I , then $f''(x)$ on I .

d) The curve $y = \frac{6x^4 - 3x^2 + 1}{1 - 7x^4}$ has a horizontal asymptote at $y =$

2. For the function $f(x) = x^4 - 12x^3 + 48x^2 - 64x$ find:

- a) critical points of f
- b) inflection points of f**

3. Find the maximum and minimum values of f over the indicated interval:
Show all algebraic steps.

$f(x) = \cos^2 x + \sin x$ on $[-\pi, \pi]$

4. An isosceles triangle is drawn with its vertex at the origin and its base parallel to the x -axis. The vertices of the base are on the curve $5y = 25 - x^2$

- a) make a sketch of the triangle.
- b) Find the area of the largest such triangle.

5. Find the values of a , b and c so that $(1, 5)$ is a critical point of f and $(2, 3)$ is an inflection point of f .

6. Sketch a graph of a function which satisfies all of the conditions below.
 f is continuous only on $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$

$f(0) = 0: f(3) = 2$

$f'(3) = 0 \quad f'(0) = 0$

$\lim_{x \rightarrow 2^-} f(x) = -\infty \quad \lim_{x \rightarrow 2^+} f(x) = \infty \quad \lim_{x \rightarrow 2^-} f(x) = \lim_{x \rightarrow 2^+} f(x) = -\infty$

$\lim_{x \rightarrow -\infty} f(x) = 0 \quad \lim_{x \rightarrow \infty} f(x) = -\infty$

$f'(x) > 0$ on $(2, 3) \quad f'(x) < 0$ on $(-\infty, -2) \cup (-2, 0) \cup (0, 2) \cup (3, \infty)$

$f''(x) < 0$ on $(-\infty, -2) \cup (-2, 0) \cup (0, 2) \cup (3, \infty)$

$f''(x) > 0$ on $(-2, 0)$

7. Let $f(x) = \frac{x}{\sqrt{x^2 + 1}}$

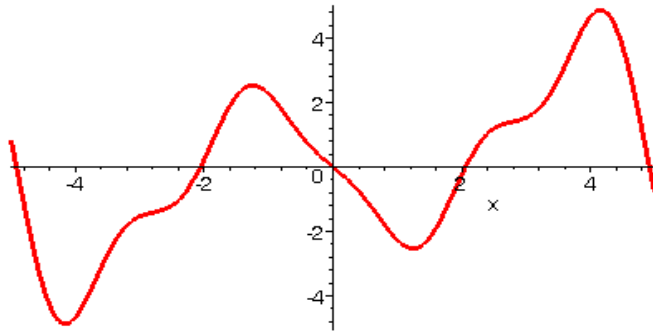
The first derivative of this function is $f'(x) = \frac{1}{(x^2 + 1)^{3/2}}$.

The second derivative of this function is $f''(x) = \frac{-x}{3(x^2 + 1)^{5/2}}$

Given the information above, sketch a complete graph of f , state local extrema and inflection points.

Study guide for Exam 2 Math 170 - Sestini

8. The figure below shows the graph of the derivative of a function f .



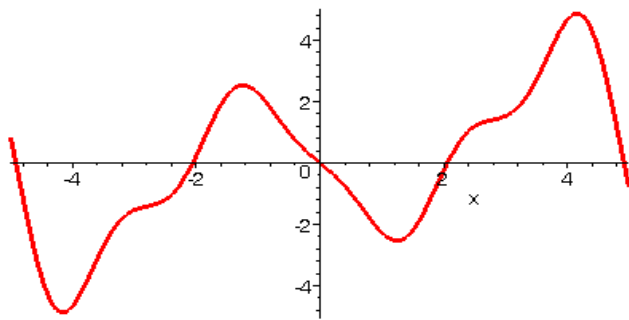
a) On what intervals is f increasing?.....

decreasing?

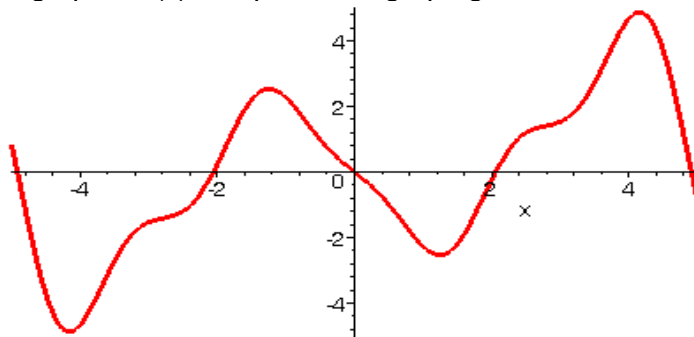
b) What x values give local extrema?

c) Where is f concave up? concave down d) What are the inflection points of f ?

e) Sketch a graph of $f''(x)$ Graph on the graph given of the derivative of f , below:



f) Sketch a graph of $f(x)$. Graph on the graph given of the derivative of f , below:



Homework 4.7

4.7 # 3,5,14,17,21,24,31,33,57,71