

## Math 1210-1    Review 2

1. Find  $f'(x)$ :

(a)  $f(x) = 2 \cos^3 x$

(b)  $f(x) = x^2 \sin x$

(c)  $f(x) = x^{2/3}$

(d)  $f(x) = \sqrt{\sin^2 x + 1}$

(e)  $f(x) = \frac{x^3 + 5x^2 - 2x + 7}{x^2 - 3x + 9}$

2. Find  $\frac{d^5 y}{dx^5}$  if  $y = x^6 + x^2 + 1$ .

3. Define each of the following:

(a) Function

(b) Limit (informal definition please)

(c) Derivative (formal definition please)

(d) Operator

(e) Odd Function

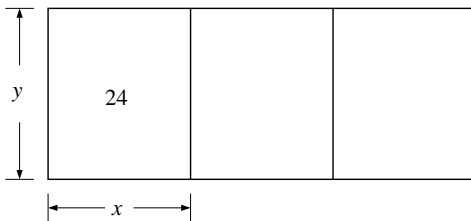
(f) Even Function

4. Show that if  $f(x) = x^5 - x^2 - 3x + 1$ , then  $f$  has a root between 0 and 1.

5. The curve  $\gamma$  is given implicitly by  $x^4 + 3xy^3 + x^2y^2 = 5$ . Find the slope of the line  $\ell$  which is tangent to  $\gamma$  at  $(-1, 1)$ .

6. A small helium balloon is being inflated. The radius of the balloon is growing at a rate of 5 cm per second. How fast is the volume of the balloon increasing when the radius is 15 cm?

7. A farmer wishes to fence off three identical adjoining rectangular pens each with 24 square meters of area. What should the width,  $x$ , and length,  $y$ , of each pen be in order to minimize the amount of fence required?



8. Justin traveled 112 miles in 2 hours and claimed that he never exceeded 55 miles per hour. Disprove Justin's claim.

9. Tell me everything you can about critical points, extreme values, inflection points, slope, and concavity.

10. A function  $f$  has the following properties:

- (a)  $\lim_{x \rightarrow -1^-} f(x) = -\infty$
- (b)  $\lim_{x \rightarrow -1^+} f(x) = +\infty$
- (c)  $f(-2.5) = 0.5$
- (d)  $f(-2) = 0.75$
- (e)  $f(0) = 0.5$
- (f)  $f(1) = 1$
- (g)  $f(2) = 0.5$
- (h)  $f(3) = -0.5$
- (i)  $f'(-2) = 0$
- (j)  $f'(0) = 0$
- (k)  $f'(1) = 0$
- (l)  $f'(2) = 0$
- (m)  $f'(x) > 0$  for  $x < -2$
- (n)  $f''(x) > 0$  for  $x < -2.5$  and  $-1 < x < 0.5$  and  $1.5 < x < 2$
- (o)  $f''(x) < 0$  for  $-2.5 < x < -1$  and  $0.5 < x < 1.5$  and  $x > 2$
- (p)  $\lim_{x \rightarrow -\infty} f(x) = 0$

Graph  $y = f(x)$  on the window provided. Mark all interesting points on your graph and state what type of point they are.

