

1. Find  $f'(x)$  for

a.  $f(x) = \cos(x^2 + x)$   $f'(x) = -\sin(x^2 + x)(2x + 1)$

all but 4

b.  $f(x) = \sqrt{\cos x^2} = (\cos x^2)^{1/2}$

$$f'(x) = \frac{1}{2} (\cos x^2)^{-1/2} (-\sin x^2)(2x)$$

$$= \frac{-x \sin x^2}{\sqrt{\cos x^2}}$$

1/2

2. Find a function  $f$  such that  $f'(x) = x^3$ , and  $f(1) = 3$ .

$$f(x) = \frac{x^4}{4} + C$$

$$3 = \frac{1}{4} + C$$

$$C = 2\frac{3}{4}$$

$$f(x) = \frac{x^4}{4} + \frac{11}{4}$$

most

3. Find all critical points of  $f(x) = 3x^5 - 5x^3 + 7$ .

$$f'(x) = 15x^4 - 15x^2 = 0$$

$$15x^2(x^2 - 1) = 0$$

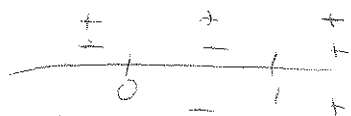
$$(x=0, x=\pm 1)$$

almost all

4. For what values of  $x$  is  $f(x) = 3x^4 - 4x^3$  increasing? decreasing?

$$f'(x) = 12x^3 - 12x^2$$

$$12x^2(x-1)$$



I  $[1, \infty)$

D  $(-\infty, 1]$

1/4

5. Find all relative maxima and minima for the function  $f(x) = 2x^3 - 12x^2 + 18x - 7$ .

Give reasons.

$$f'(x) = 6x^2 - 24x + 18$$

$$= 6(x^2 - 4x + 3)$$

$$= 6(x-3)(x-1)$$

C.R.  $x=1, x=3$

$$x=1$$

$$x=3$$

$$f''(1) = -12 < 0$$

$$f''(3) = 12 > 0$$

rel max

rel min

$$f(1) = 1$$

$$f(3) = -7$$

$$f''(x) = 12x - 24$$

or

$$x=1$$

$$x=3$$

many got