p. 215 evens

#14 $(0,0)$

#16 $(0,0)$, $(2,16)$

#18 $(1,4)$

#20 $(0,0)$, $(\sqrt{3}, \sqrt{3}/4)$, $(-\sqrt{3}, -\sqrt{3}/4)$

#22 (a) zero: $x \approx 0, 1.2$

$+$: $(-1.2, 0)$, $(1.2, \infty)$

$-$: $(-\infty, 1.2)$, $(0, 1.2)$

(b) zero: $x \approx \pm 0.7$

$+$: $(-\infty, -0.7)$, $(0.7, \infty)$

$-$: $(-0.7, 0.7)$

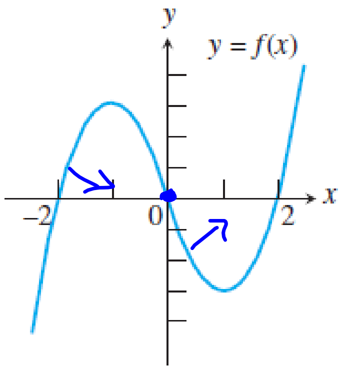
#24 (a) $[-2, 2]$

(b) $(-\infty, -2]$, $[2, \infty)$

(c) max $x = 2$, min $x = -2$

In Exercises 21 and 22, use the graph of the function f to estimate where (**a**) f' and (**b**) f'' are 0, positive, and negative.

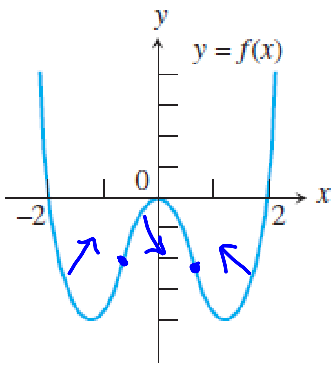
21.



(a) Zero: $x = \pm 1$;
positive: $(-\infty, -1)$ and $(1, \infty)$;
negative: $(-1, 1)$

(b) Zero: $x = 0$;
positive: $(0, \infty)$;
negative: $(-\infty, 0)$

22.

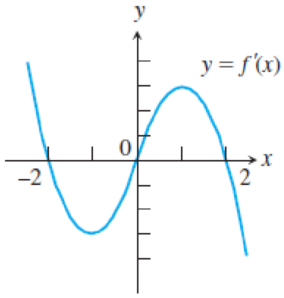


(a) Zero: $x \approx 0, \pm 1.25$;
positive: $(-1.25, 0)$ and $(1.25, \infty)$;
negative: $(-\infty, -1.25)$ and $(0, 1.25)$

(b) Zero: $x \approx \pm 0.7$;
positive: $(-\infty, -0.7)$ and $(0.7, \infty)$;
negative: $(-0.7, 0.7)$

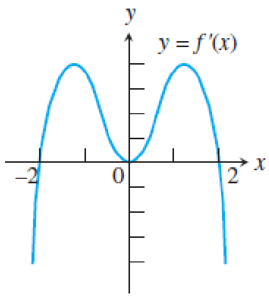
In Exercises 23 and 24, use the graph of the function f' to estimate the intervals on which the function f is (**a**) increasing or (**b**) decreasing. Also, (**c**) estimate the x-coordinates of all local extreme values.

23.



(**a**) $(-\infty, -2]$ and $[0, 2]$
(**b**) $[-2, 0]$ and $[2, \infty)$
(**c**) Local maxima: $x = -2$ and $x = 2$; local minimum: $x = 0$

24.



(**a**) $[-2, 2]$ (**b**) $(-\infty, -2]$ and $[2, \infty)$
(**c**) Local maximum: $x = 2$; local minimum: $x = -2$

p.242 #1 linearize @ $x=2$
approx. $f(2.1)$ with $L(2.1)$

$$f(x) = x^3 - 2x + 3$$

$x = 2 \quad f(2) = 7$

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

$$f'(2) = 10$$

$$L(x) = f(2) + f'(2)(x-2)$$

(a) $L(x) = 7 + 10(x-2)$

(b) $f(2.1) = 8.061$

$$L(2.1) = 7 + 10(.1)$$
$$= 8$$

error $= |f(2.1) - L(2.1)| = 0.061$

#19 $y = x^3 - 3x$

$y' = 3x^2 - 3$

(a) $dy = (3x^2 - 3) \cdot dx$

(b) $x = 2$ $dx = .05$

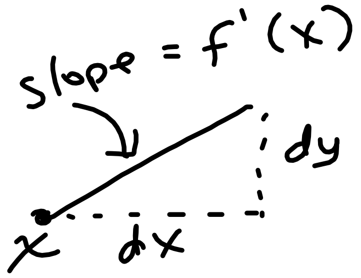
$dy = 9 \cdot .05$

$= .45$

when $x = 2$

then @ 2.05

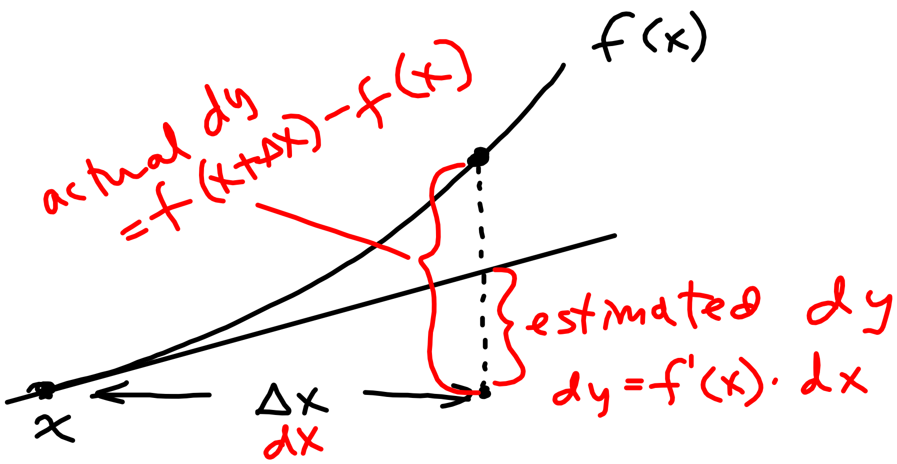
change in y: .45



$\frac{dy}{dx} = \text{slope} = f'(x)$

$dy = f'(x) \cdot dx$

close to x



#31 $f(x) = x^2 + 2x$ $a = 0$ $dx = 0.1$

(a) true change

$f(0.1) - f(0)$

$= .21 - 0$

$= .21$

(b) $df = f'(x) \cdot dx$

$= (2x+2) \cdot 0.1$

$= 0.2$

(c) error $= |.21 - .2| = .01$

* f concave up: tangent line <u>underestimates</u> actual fcn value

f concave down, overestimates

*