# 4.2

9] $f(x) = x + \frac{1}{x} \qquad 0.5 \le x \le 2$

$f(.5) = .5 + \frac{1}{.5} = 2.5$

$f(2) = 2 + \frac{1}{2} = 2.5$

(a) $\boxed{y = 2.5}$

$f(1) = 1 + \frac{1}{1} = 2$

(b) $y = 2$

$f'(x) = 1 + -\frac{1}{x^2} = 0$

$1 = \frac{1}{x^2}$

$x^2 = 1$

$x = \pm 1$

$x = 1$

---

$(.5, 2.5)$ , $(2., 2.5)$

$\frac{2.5 - 2.5}{2 - .5} = 0$

$y = mx + b$

$2.5 = 0(2) + b$

$2.5 = b$

$y = 0x + 2.5$

$\boxed{y = 2.5}$

23] $f(x) = x\sqrt{4 - x} \qquad x \le 4$

$f(x) = x(4-x)^{1/2}$ &

$f'(x) = (4-x)^{1/2} + \frac{1}{2}(4-x)^{-1/2}[-1]\,x = 0$

$(4-x)^{-1/2}\left[(4-x) + \frac{-1}{2}x\right] = 0$

$= \frac{4 - \frac{3}{2}x}{\sqrt{4-x}} = 0$

$x \neq 4 \qquad x < 4$

$f'(0) = +$ $\qquad f'(3) = -$

$(-\infty, \frac{8}{3})$ INCREASING

$(\frac{8}{3}, 4)$ DECREASING

$x = \frac{8}{3}$ LOCAL MAX

$4 - \frac{3}{2}x = 0$

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

$\frac{8}{3} = x$

4.2

25| $h(x) = \frac{-x}{x^2+4}$ $\begin{matrix} f \\ g \end{matrix}$

$h'(x) = \frac{-1(x^2+4) - 2x(-x)}{(x^2+4)^2}$

$= \frac{-x^2-4+2x^2}{(x^2+4)^2}$

$= \frac{x^2-4}{(x^2+4)^2}$

$h'(-3) = +$

$h'(0) = -$

$h(3) = +$

$x^2-4=0$

$x = \pm 2$

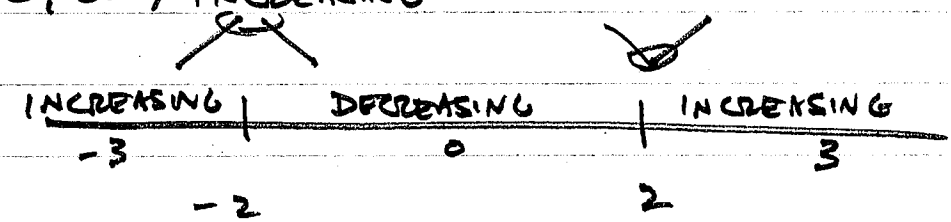
$(-\infty, -2)$ INCREASING

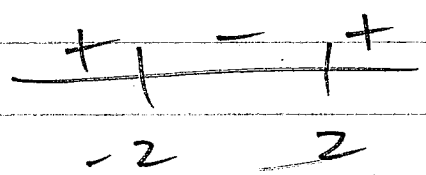
$(-2, 2)$ DECREASING

$(2, \infty)$ INCREASING

LOCAL MAX $x=-2$

LOCAL MIN $x=2$



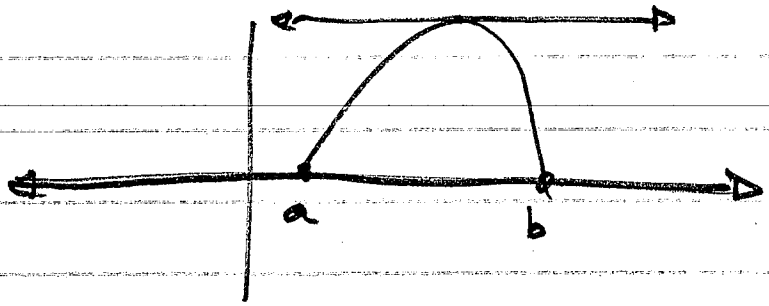



# 4.2

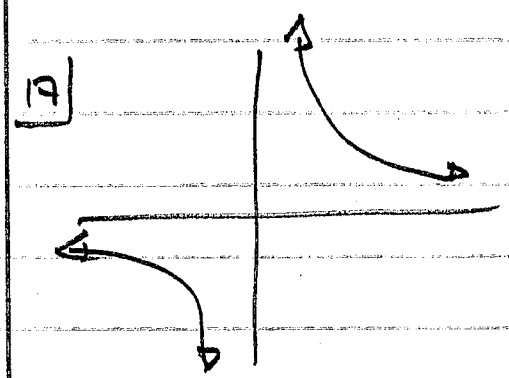
49 $x + \ln(x+1) = 0$ $\quad 0 + \ln(0+1) = f(0)$

$0 + \ln 1$

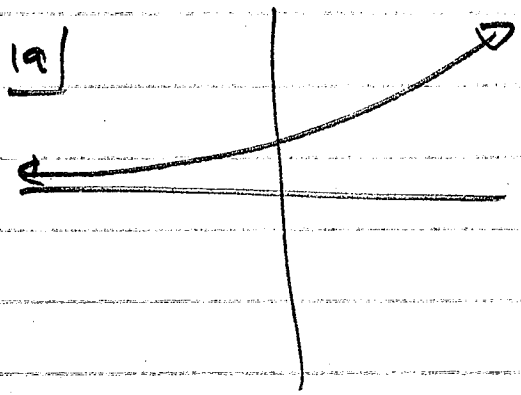
$f'(x) = 1 + \frac{1}{x+1}$ $\quad 0 \le x \le 3$ $\quad 0 = f(0)$ $\quad 0 \le x \le 3$




19



19



27 $f(x) = x^3 - 2x - 2\cos x$

$f'(x) = 3x^2 - 2 + 2\sin x = 0$

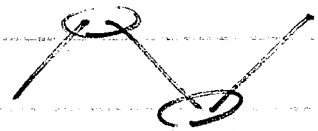
4.2

27) $f(x) = x^3 - 2x - 2\cos x$

$f'(x) = 3x^2 - 2 + 2\sin x = 0$

| INCR. | DECR. | INCR |
|---|---|---|
| $f'(x)>0$ | $f'(x)<0$ | $f'(x)>0$ |
| $-2$ | $0$ | $1$ |

$-1.1263$ $.55937$



INCR. $(-\infty, -1.1263) \cup (.55937, \infty)$

DECR $(-1.1263, .55937)$

LOCAL MAX $(-1.1263,$

LOCAL MIN $(.55937,$

9) $f(x) = x + \frac{1}{x}$, $[.5, 2]$ $\quad \frac{f(b)-f(a)}{b-a} = \frac{2.5-2.5}{1.5} = 0$

$f'(x) = 1 + \frac{-1}{x^2} = 0$

$1 = \frac{1}{x^2}$ $\quad 1 + \frac{1}{1} = 2$ $\quad y = 0x + 2$

$x^2 = 1$ $\quad y = 2$

$x = \pm 1$

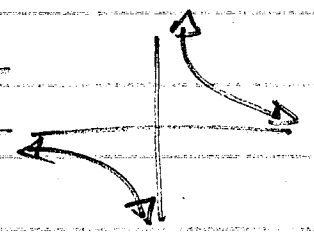
$x = 1$

17) $h(x) = \frac{2}{x}$

$h'(x) = \frac{-2}{x^2} = 0 \quad x \neq 0$

| DECR | DECR |
|---|---|
| $f'(x)<0$ | $f'(x)<0$ |
| $-1$ | $1$ |

$0$

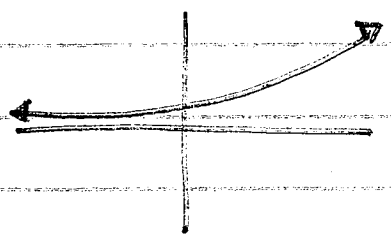


$(-\infty, \infty)$ DECREASING

19) $f(x) = e^{2x}$

$f'(x) = 2e^{2x} = 0$

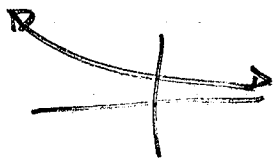
$(-\infty, \infty)$ INCREASING



4.2

20| $f(x) = e^{-.5x}$

$f'(x) = -.5e^{-.5x} = 0 \quad f'(x) < 0$



DECREASING $(-\infty, \infty)$

10| $f(x) = \sqrt{x-1}, [1,3]$

$f'(x) = \frac{1}{2}(x-1)^{-\frac{1}{2}} \quad x \neq 1$

$= \frac{1}{2\sqrt{x-1}} = \frac{\sqrt{2}}{2} \cdot 2$

$= \frac{1}{\sqrt{x-1}} = \sqrt{2}$

$\frac{1}{x-1} = 2$

$1 = 2x - 2$

$3 = 2x$

$\frac{3}{2} = x$

$y = \frac{\sqrt{2}}{2}x - \frac{\sqrt{2}}{2}$

$\frac{f(b)-f(a)}{b-a} = \frac{\sqrt{2}-0}{2} = \frac{\sqrt{2}}{2}$

$(\frac{3}{2}, \sqrt{\frac{1}{2}})$

$y = mx + b$

$\frac{1}{2} = \frac{\sqrt{2}}{2}(\frac{3}{2}) + b$

$\frac{\sqrt{2}}{2} = \frac{3\sqrt{2}}{4} + b$

$-\frac{3\sqrt{2}}{4} \quad -\frac{3\sqrt{2}}{4}$

$-\frac{\sqrt{2}}{2} = b$

15| $f(x) = 5x - x^2$

$f'(x) = 5 - 2x = 0$

$5 = 2x$

$\frac{5}{2} = x$

| INCR. | DECR. |
|---|---|
| $f'(x) > 0$ | $f'(x) < 0$ |
| 0 | 3 |

$\frac{5}{2}$

INCR. $(-\infty, \frac{5}{2})$

DECR. $(\frac{5}{2}, \infty)$

LOCAL MAX $(\frac{5}{2}, \frac{+25}{4})$

4.2

28) $g(x) = 2x + \cos x$ ←

$g'(x) = 2 - \sin x = 0 \qquad 1 \le g'(x) \le 3$

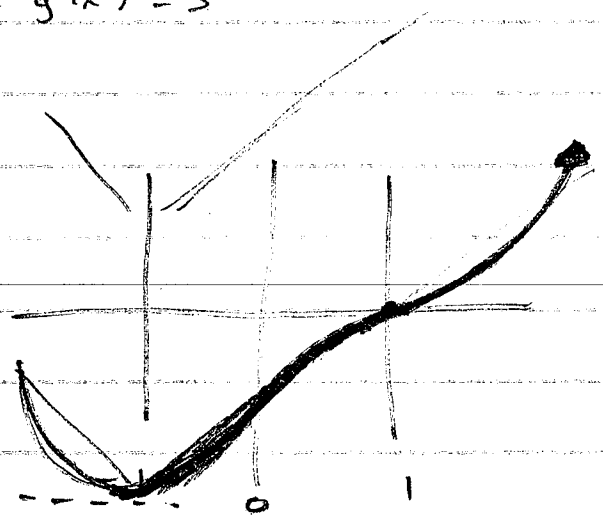
INCREASING $(-\infty, \infty)$

41) $f'(-1) = f'(1) = 0$

$f'(x) > 0$ ON $(-1, 1)$

$f'(x) < 0$ FOR $x < -1$

$f'(x) > 0$ FOR $x > 1$

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