Mr. Konichek
Hmwk 4.4

4.4 Pg. 313 (1, 9, 15, 19, 20, 21, 35)

1. From the graph absolute max. $(-1, 4)$
   " min. $(1, 0)$

9. $f(x) = 2x^2 + 3x - 4$

$f'(x) = 4x + 3$

$4x + 3 = 0$

$4x = -3$

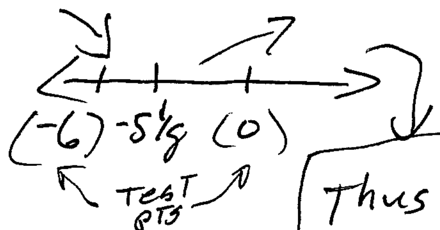
$x = -3/4$

$f(-3/4) = 2(-3/4)^2 + 3(-3/4) - 4$

$= 2(9/16) - 9/4 - 4$

$= \frac{9}{8} - \frac{18}{8} - 4$

$= -\frac{9}{8} - 4 = -1\frac{1}{8} - 4$



$f(-3/4) = -5\frac{1}{8}$

Thus $(-3/4, -5\frac{1}{8})$ is the absolute MIN.

15. $f(x) = x^2 - 2x - 3$ on $[-2, 3]$

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

$(2x - 2) = 0$

$2(x - 1) = 0$

$x = 1$

so we simply test $f(-2)$ $f(1)$ and $f(3)$

$f(-2) = (-2)^2 - 2(-2) - 3 = 4 + 4 - 3 = 5$ largest of the three

$f(1) = 1 - 2 - 3 = -4$ ← smallest of the three

$f(3) = 9 - 6 - 3 = 0$

So it follows that $\boxed{-4 \text{ is the absolute minimum}}$

and $\boxed{+5 \text{ is the absolute maximum value of } f.}$

(Graphing calculator confirms this.)

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4.4 Pg 314 (19, 20, 21, 35)

19. $f(x) = x^3 + 3x^2 - 1$ on $[-3, 2]$

$f'(x) = 3x^2 + 6x$

$3x(x+2) = 0$

$x = 0 \quad x = -2$

$f(-3) = -27 + 27 - 1 = -1$ smallest #

$f(2) = 8 + 12 - 1 = 19$ largest #

$f(0) = -1$ equal to smallest #

$f(-2) = -8 + 12 - 1 = 3$

$\boxed{\text{absolute max. } 19 \quad \text{absolute min. value } -1}$

20. $g(x) = x^3 + 3x^2 - 1$ on $[-3, 1]$

$g'(x) = 3x^2 + 6x$

$3x(x+2) = 0$

$x = 0 \quad x = -2$

$g(-3) = \cancel{27 - 18 = 9}$ $-27 + 27 - 1 = -1$ min

$g(1) = \cancel{3 + 6 = 9}$ $1 + 3 - 1 = 3$ max

$g(0) = -1$ min

$g(-2) = -8 + 12 - 1 = 3$ max

$\boxed{\text{ab. max. } 3 \;;\; \text{ab. min. } -1}$

21. $g(x) = 3x^4 + 4x^3$ on $[-2, 1]$

$g'(x) = 12x^3 + 12x^2$

$12x^2(x+1) = 0$

$x = 0 \quad x = -1$

$g(-2) = 48 - 32 = 16$ largest #

$g(1) = 3 + 4 = 7$

$g(0) = 0$

$g(-1) = 3 - 4 = -1$ smallest #

$\boxed{\text{ab. max. } 16 \;;\; \text{ab. min. } -1}$

35. $f(x) = x/(x^2+2)$ on $[-1, 2]$

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

cont. on next page

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4.4 Pg. 314 (35 cont.)

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

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

note x^2+2 not defined at $\pm$ opps cannot make denominator zero so lets make numerator zero.

$$-x^2+2=0$$
$$-x^2=-2$$
$$x^2=2$$
$$x=\pm\sqrt{2}$$

$$f(-1) = \frac{-1}{(-1)^2+2} = \frac{-1}{1+2} = -\frac{1}{3}$$

$$f(2) \quad \frac{2}{(2)^2+2} = \frac{2}{4+2} = \frac{2}{6} = \frac{1}{3}$$

$$f(\sqrt{2}) = \frac{\sqrt{2}}{(\sqrt{2})^2+2} = \frac{\sqrt{2}}{2+2} = \frac{\sqrt{2}}{4} \approx .35$$ largest #

$$f(-\sqrt{2}) = \frac{-\sqrt{2}}{(-\sqrt{2})^2+2} = \frac{-\sqrt{2}}{2+2} = -\frac{\sqrt{2}}{4} \approx -.35$$ smallest #

Textbook wrong

$$\boxed{\text{ab. max } \frac{\sqrt{2}}{4} \qquad \text{ab. min } -\sqrt{2}/4}$$