

③ $f(x) = -\frac{1}{3}x^5 - 3x^2 + 3x + 2$

$\lim_{x \rightarrow \infty} f(x) = -\infty$ $\lim_{x \rightarrow -\infty} f(x) = \infty$ (c)

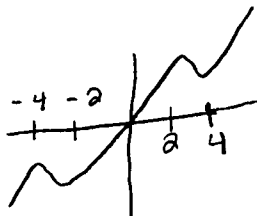
④ $f(x) = -\frac{1}{3}x^6 + 2x^5 - 3x^4 + \frac{1}{2}x + 5$

$\lim_{x \rightarrow \infty} f(x) = \lim_{x \rightarrow -\infty} f(x) = -\infty$ (b)

⑪ $y = 3x^5 - 100x^3 + 960x$

increasing $(-\infty, -4)$
 $(-2, 2)$ $(4, \infty)$

decreasing $(-4, -2)$ $(2, 4)$



critical pts
 $x = -4, x = -2, x = 2, x = 4$

⑱ $f(x) = x^3 - 6x^2 + 9x$

$f'(x) = 3x^2 - 12x + 9$

$3x^2 - 12x + 9 = 0$

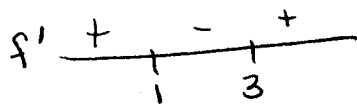
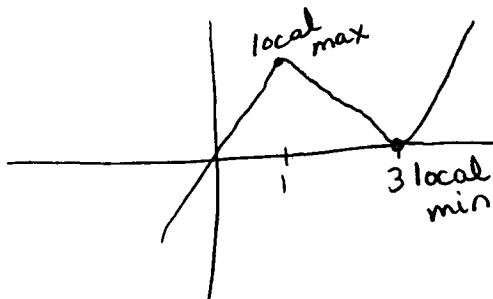
$x^2 - 4x + 3 = 0$

$(x-3)(x-1) = 0$

$x = 3, x = 1$

increasing $(-\infty, 1)$ $(3, \infty)$
 decreasing $(1, 3)$

$f(1) = 4$
 $f(3) = 0$



⑲ $f(x) = (x-1)^2(x+2)^2$

$f'(x) = 2(x-1)(x+2)^2 + (x-1)^2 2(x+2)$

$= 2(x-1)(x+2)[x+2+x-1]$

$= 2(x-1)(x+2)(2x+1)$

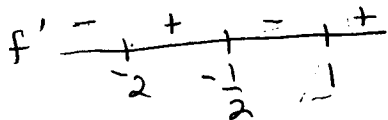
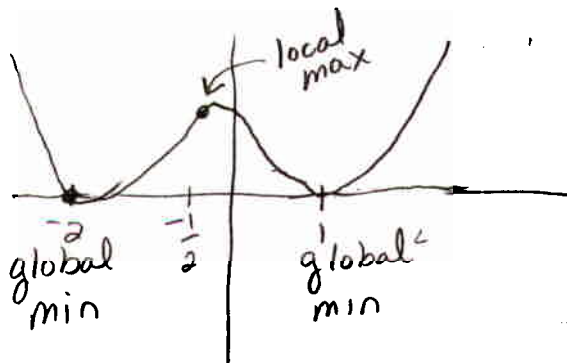
$2(x-1)(x+2)(2x+1) = 0$

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

increasing $(-2, 1)$ $(\frac{3}{2}, \infty)$

decreasing $(-\infty, -2)$ $(1, \frac{3}{2})$

$f(-2) = f(1) = 0$ $f(-\frac{1}{2}) = 5.06$

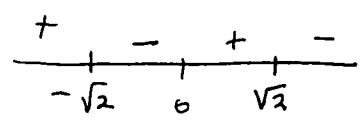


④3 $f(x) = 8x^4 - x^8$

$f'(x) = 32x^3 - 8x^7 = 8x^3(4 - x^4)$

$8x^3(4 - x^4) = 0$

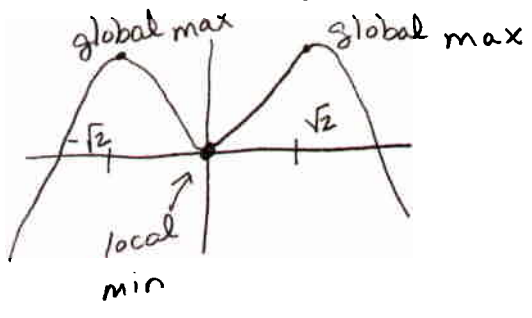
$x = 0 \quad 4 = x^4$
 $x = \pm\sqrt{2}$



increasing $(-\infty, -\sqrt{2})$ $(0, \sqrt{2})$

decreasing $(-\sqrt{2}, 0)$ $(\sqrt{2}, \infty)$

$f(0) = 0 \quad f(-\sqrt{2}) = 16 \quad f(\sqrt{2}) = 16$

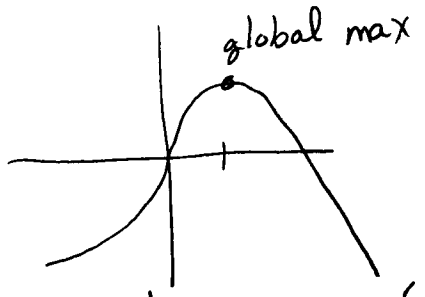
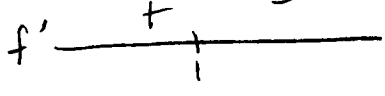


④5 $f(x) = x^{1/3}(4-x) = 4x^{1/3} - x^{4/3}$

$f'(x) = \frac{4}{3}x^{-2/3} - \frac{4}{3}x^{1/3}$

$\frac{4}{3}x^{-2/3} = \frac{4}{3}x^{1/3}$

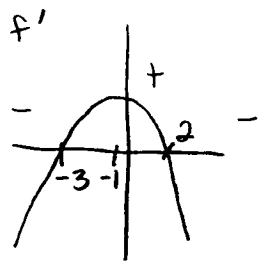
$1 = x$



increasing $(-\infty, 1)$

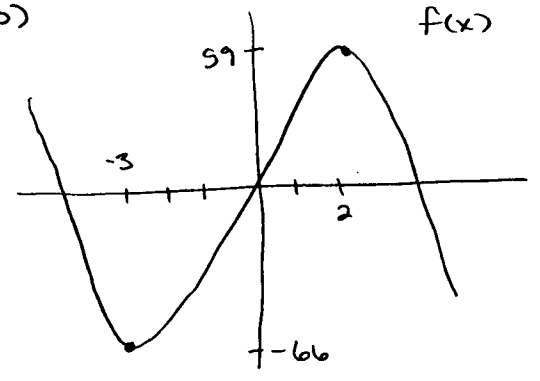
decreasing $(1, \infty)$

⑤1 $f(-3) = -66 \quad f(2) = 59$

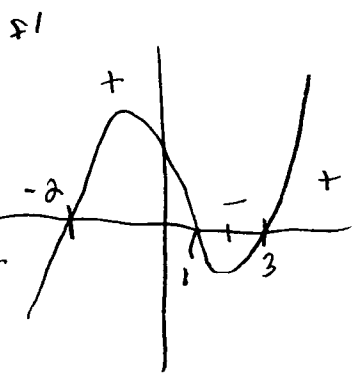


decreasing $(-\infty, -3)$ $(2, \infty)$

increasing $(-3, 2)$



⑤3 $f(-2) = -107 \quad f(1) = 82 \quad f(3) = 18$



increasing $(-2, 1)$ $(3, \infty)$

decreasing $(-\infty, -2)$ $(1, 3)$

