Calculus 5.2

#1-7 odd, 9, 11, 13-34 (thirds), 35

(1) Min: $(1,-4)$ Max: —

(3) Min: — Max: $(-2,3)$

(5) rel. Min: $(-2,1)$ rel. Max: $(-4,3)$

(7) rel. min: $(-7,-2), (-2,-2)$ rel. max: $(-4,3)$

(9) rel. min: 3 rel. max: -1

(11) rel. min: $-6, -1.5$ rel. max: $-8, -2.5$

(13) $F(x) = 2x - 10 = 0 \Rightarrow x = 5$

Min. @ $x = 5$ $(5, 8)$

$-$ | $+$ at 5 — Dec: $x < 5$; Inc: $x > 5$

(16) $F'(x) = 3x^2 + 6x - 24 = 0 \Rightarrow 3(x^2 + 2x - 8) = 3(x+4)(x-2) = 0$

rel. max @ $-4 \Rightarrow (-4, 82)$

rel. min @ $2 \Rightarrow (2, -26)$

$x = -4$ $x = 2$

$+$ | $-$ | $+$ at -4, 2

Inc: $x < -4$ & $x > 2$

Dec: $-4 < x < 2$

(19) $F'(x) = 4x^3 - 36x = 0 \Rightarrow 4x(x^2 - 9) = 0$

$x = 0$ $x = -3$ $x = 3$

Rel. min @ $x = -3$; $(-3, -85)$

Rel. min @ $x = 3$; $(3, -85)$

Rel. max @ $x = 0$; $(0, -4)$

Dec | Inc | Dec | Inc

$-$ | $+$ | $-$ | $+$ at -3, 0, 3

$f(x) = \frac{1}{7}(5-9x)^{2/3} + 1$

(22) $f'(x) = \frac{2}{21}(5-9x)^{-1/3}(-9) = \frac{-18}{21}(5-9x)^{-1/3} = \frac{-18}{21(5-9x)^{1/3}} = 0$

No x-value makes $f'(x)=0$; $f'(x)$ undefined @ $x = \frac{5}{9}$

$\frac{-}{0}$, $\frac{+}{1}$; $\frac{5}{9}$

rel. min @ $x = \frac{5}{9}$; $\left(\frac{5}{9}, 1\right)$

(25) $f'(x) = 1 + \frac{1}{x^2} = 0$ No x-value makes $f'(x)=0$; $f'(x)$ undefined @ $x=0$

$\frac{+}{-1}$, $\frac{+}{1}$; 0

No Rel. mins or maxs

(28) $f'(x) = \frac{(2x-6)(x+2) - (x^2-6x+9)(1)}{(x+2)^2} = \frac{2x^2-6x+4x-12-x^2+6x-9}{(x+2)^2}$

$f'(x) = \frac{x^2+4x-21}{(x+2)^2} = 0$ $x^2+4x-21=0$ $(x+7)(x-3)=0$ $x=-7$ $x=3$ $f'(x)$ undefined @ $x=-2$

$\frac{+}{-8}$, $\frac{-}{-3}$, $\frac{-}{0}$, $\frac{+}{4}$; -7 -2 3

rel. max @ $x=-7$; $(-7, -20)$

rel. min @ $x=3$; $(3, 0)$

(31) $f'(x) = 2 + \frac{1}{x} = 0 \Rightarrow \frac{1}{x} = -2$ $f'(x)$ is undefined @ $x=0$

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

$\frac{+}{-1}$, $\frac{-}{-1/4}$, $\frac{+}{1}$; $\frac{-1}{2}$ 0

$x=0$ & $x=\frac{-1}{2}$ is not in domain of $f(x)$

NO relative mins or max's

(34) $f'(x) = 1 + (\ln 8)(8^{-x})(-1) = 0$

$1 = (\ln 8)\left(\frac{1}{8^x}\right)$

$\frac{1}{\ln 8} = \frac{1}{8^x}$

$\ln 8 = 8^x$

$\log_8(\ln 8) = x \approx .352$

$\frac{-}{0}$, $\frac{+}{1}$; .352

Rel. min @ $x = .352$; $(.352, .832)$

No Rel max.

(35) $\frac{dy}{dx} = -4x + 12 = 0$

$x = 3$

$+ \quad 3 \quad -$

Vertex $(3, 13)$

$y_3 = -2(3^2) + 12(3) - 5$

$-18 + 36 - 5 = 13$

(36) $\frac{dy}{dx} = 2ax + b = 0$

$2ax = -b$

$\frac{2ax}{2a} = \frac{-b}{2a}$

$x = \frac{-b}{2a}$