

9, 10, 12 b

9) $f(x) = \frac{2x}{x-2}$

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

$(x-2)^2 = 0$
 $x-2=0$
 $x=2$

$f'(x)$ sign chart: $\frac{-}{2}$

a) never
 b) $(-\infty, 2) \cup (2, \infty)$

c) $f''(x) = \frac{(x-2)(-4) - (-4)(2(x-2)(1))}{(x-2)^4}$
 $= \frac{8(x-2)}{(x-2)^4}$
 $= \frac{8}{(x-2)^3}$

f'' sign chart: $\frac{-}{2}$ $\frac{+}{}$

Concave up $(2, \infty)$
 Concave down $(-\infty, 2)$

$x=2$ $f(2) = \frac{2(2)}{2-2}$
 \rightarrow undefined
 No inflection point

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10) $f(x) = (2x-5)^3$

$f'(x) = 3(2x-5)^2(2)$
 $0 = 6(2x-5)^2$

$(2x-5)^2 = 0$
 $2x-5=0$
 $x=5/2$

$f'(x)$ sign chart: $\frac{+}{5/2}$ $\frac{+}{}$

a) $(-\infty, 5/2) \cup (5/2, \infty)$
 b) Never

$f''(x) = 12(2x-5)(2)$
 $0 = 24(2x-5)$
 $x=5/2$

$f''(x)$ sign chart: $\frac{-}{5/2}$ $\frac{+}{}$

c) $(5/2, \infty)$
 d) $(-\infty, 5/2)$
 e) $(5/2, 0)$

$f(5/2) = 0$

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12 b)

$f(x) = 2x^3 - 15x^2 + 24x + 2$ $[0, 2]$

$f'(x) = 6x^2 - 30x + 24$
 $= 6(x^2 - 5x + 4)$
 $= 6(x-4)(x-1)$
 $x=4, x=1$
 reject

$f(0) = 2$ (abs min)
 $f(1) = 13$ (abs max)
 $f(2) = 6$

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11. $f(x) = \frac{x^2}{x^2+1}$

$-x=0$
 $x=0$

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

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

$f''(x) = \frac{-8(x^2+1)^2 + 32x^2(x^2+1)}{(x^2+1)^4}$
 $= \frac{24x^2 + 32}{(x^2+1)^3}$

$f''(x)$ sign chart: $\frac{+}{-2}$ $\frac{+}{0}$ $\frac{-}{2}$ $\frac{-}{}$

a) $(-\infty, -2) \cup (-2, 0)$
 b) $(0, 2) \cup (2, \infty)$

c) $(-\infty, -2) \cup (2, \infty)$
 d) $(-2, 2)$
 e) no P.o.I's

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