

Section 4.1-4.3 Part 2 : Additional Problems Solutions

1. domain is all real numbers greater than 3
 (a) cv: $x = 7$
 (b) inc: $(7, \infty)$
 dec: $(3, 7)$
 (c) local min at $x = 7$
2. domain is all real numbers greater than zero
 (a) cv: $x = e^{-1/2}$
 (b) inc: $(e^{-1/2}, \infty)$
 dec: $(0, e^{-1/2})$
 (c) local min at $x = e^{-1/2}$
3. domain is all real numbers
 (a) cv: $x = -3, 0$
 (b) inc: $(-3, 0), (0, \infty)$
 dec: $(-\infty, -3)$
 (c) local min at $x = -3$
 neither at $x = 0$
4. domain is all real numbers
 (a) $y' = (2x - 1)(x - 1)e^{x^2 - 3x}$
 cv: $x = 1, 1/2$
 (b) inc: $(-\infty, 1/2), (1, \infty)$
 dec: $(1/2, 1)$
 (c) local min at $x = 1$
 local max at $x = 1/2$
5. domain is all real numbers
 (a) cv: $x = -3, 0, 3$
 (b) inc: $(-3, 0), (3, \infty)$
 dec: $(-\infty, -3), (0, 3)$
 (c) local max at $x = 0$
 local min at $x = -3$ and $x = 3$
6. domain is all real numbers
 (a) cv: $x = 2, 3, 4$
 (b) inc: $(3, 4), (4, \infty)$
 dec: $(-\infty, 2), (2, 3)$
 (c) local min at $x = 3$
 neither at $x = 2$ and $x = 4$
7. (a) cv: $x = -5, 0, 4$
 (b) inc: $(-5, 0), (0, 4), (4, \infty)$
 dec: $(-\infty, -5)$
 (c) local min at $x = -5$
 neither at $x = 0$ and $x = 4$
8. (a) cv: $x = -5, 4$
 (b) inc: $(-\infty, -5), (-5, 4)$
 dec: $(4, \infty)$
- (c) local max at $x = 4$
 neither at $x = -5$
9. (a) cv: $x = 1, x = 4$
 (b) inc: $(1, 2), (2, 4)$
 dec: $(-\infty, -2), (-2, 1), (4, \infty)$
 (c) local max at $x = 4$
 local min at $x = 1$
10. (a) cv: $x = \frac{7}{3}$
 (b) inc: $(-5, \frac{7}{3})$
 dec: $(-\infty, -5), (\frac{7}{3}, \infty)$
 (c) local max at $x = \frac{7}{3}$
11. concave up: $(-\infty, 0), (3, \infty)$
 concave down: $(0, 3)$
12. concave up: $(6, \infty)$
 concave down: $(-\infty, -5), (-5, 6)$
13. concave up: $(-\infty, -1), (1, \infty)$
 concave down: $(-1, 1)$
14. concave up: $(4, \infty)$
 concave down: $(2, 4)$
15. concave up: $(-3, 3)$
 concave down: $(-\infty, -3), (3, \infty)$
16. concave up: $(-5, 4), (4, \infty)$
 concave down: $(-\infty, -5)$
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17. since $x = 2$ is a critical value, $f'(2) = 0$
 $0 = 3a(2)^2 - 18(2)$
 $a = 3$
 since $(2, 4)$ is a point, $f(2) = 4$
 $4 = 3(2)^3 - 9(2)^2 + b$
 $b = 16$
18. $f'(x) = e^{ax} + xae^{ax}$ and $f'(0.5) = 0$
 $0 = (1 + 0.5a)e^{0.5a}$
 Answer: $a = -2$
19. $f'(1) = 2$ gives $2 = 3a(1)^2 - 8(1) + b$
 or $b = -3a + 10$
 $f(x) = ax^3 - 4x^2 + (-3a + 10)x + 2$
 since $f(1) = 20$
 $20 = a - 4 + (-3a + 10) + 2$
 $a = -6$ and $b = 28$
20. $f''(x) = 6x + 2B$ and $f''(3) = 0$
 Answer: $B = -9$
21. $f''(x) = 2a + \frac{b}{x^2}$, $f(1) = 5$ and $f''(1) = 0$
 Answer: $a = 5$, $b = -10$
22. $a = 4$, $b = 60$