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1. The sum of all critical numbers of $f(x) = x^{3/4} - 9x^{1/4}$ is

(a) 9

(b) 3

(c) 6

(d) 0

(e) 12

2. The function $f(x) = x^4 - 4x^3$ has

(a) a relative minimum at $x = 3$ and an inflection point at $x = 0, 2$

(b) a relative minimum at $x = 0$

(c) a relative maximum at $x = 0$ and inflection points at $x = 3$

(d) a relative minimum at $x = 3$ and an inflection point at $x = 1$

(e) both a relative maximum and an inflection point at $x = 0$

3. The absolute maximum value of $f(x) = \frac{x^4}{4} - \frac{9}{2}x^2$ on the interval $[0, 4]$ is

(a) 0

(b) -8

(c) $-\frac{81}{4}$

(d) 8

(e) 7

4. The function $f(x) = \frac{2x+4}{x^2-4}$ has

(a) 1 vertical asymptote and 1 horizontal asymptote

(b) 1 vertical asymptote and no horizontal asymptote

(c) 2 vertical asymptotes and 1 horizontal asymptote

(d) 1 horizontal asymptote and no vertical asymptote

(e) 2 vertical asymptotes and no horizontal asymptote

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5. The graph with equation $y = \dfrac{x+1}{x-1}$ is

(a) concave up on $(-\infty, 1)$, concave down on $(1, \infty)$

(b) concave down on $(-\infty, 1)$, concave up on $(1, \infty)$

(c) concave up on $(-\infty, 0)$, concave down on $(0, \infty)$

(d) concave down on $(-\infty, 0)$, concave up on $(0, \infty)$

(e) concave down everywhere

6. Two positive numebers a and b have minimum sum and product equal to 100. Then $3a + b =$

(a) 40

(b) 20

(c) 10

(d) 50

(e) 70

7. The oblique asymptote of $f(x) = \dfrac{10x^2 + 9x + 5}{5x + 2}$ intersects the x-axis at $x =$

(a) $-\dfrac{1}{2}$

(b) -1

(c) 0

(d) 1

(e) $\dfrac{3}{2}$

8. A manufacturer can produce at most 120 units of a certain product. The demand equation for the product is

$$p = q^2 - 100q + 3200$$

and the manufacturer's average cost function is

$$\overline{c} = \frac{2}{3}q^2 - 40q + \frac{10000}{q}.$$

The maximum profit for the manufacturer is

(a) 86000

(b) 10000

(c) 43333.33

(d) 92000

(e) 32666.66

9. Let $f(x) = \dfrac{x^2}{2-x}$. Then

(a) 0 and 4 are the critical values of f

(b) 0 is the only critical value of f

(c) 2 is the only critical value of f

(d) 0 and 2 are the critical values of f

(e) 2 and 4 are the critical values of f

10. Given $f(x) = 3x^2 - 5$. If x changes from 2 to 2.1, then the values of $\triangle y$ and dy are

(a) 1.23, 1.20

(b) 1.42, 1.20

(c) 1.30, 1.25

(d) 1.20, 1.10

(e) 1.25, 1.21

11. A cylindrical can, open at the top, is to have a fixed volume of 27. If the least amount of material is to be used, then the radius r and height h of the cylinder are

(a) $r = \dfrac{3}{\sqrt[3]{\pi}} \quad h = \dfrac{3}{\sqrt[3]{\pi}}$

(b) $r = \pi \quad h = 1$

(c) $r = 1 \quad h = 2\pi$

(d) $r = \sqrt[3]{\dfrac{8}{\pi}} \quad h = \sqrt[3]{\dfrac{8}{\pi}}$

(e) $r = \dfrac{1}{2} \quad h = 3$

12. If $y''' = e^x + 1$ and $y''(0) = 1,\ y'(0) = 2,\ y(0) = 3$, then $y(1) =$

(a) $e + \dfrac{19}{6}$

(b) $e - \dfrac{1}{6}$

(c) $e + \dfrac{13}{2}$

(d) $2e + \dfrac{3}{4}$

(e) $e + 2$

13. For the revenue function $r = 240q + 57q^2 - q^3$, the maximum revenue is

(a) 36800

(b) 700

(c) 37500

(d) 48750

(e) 51200

14. $\int \left(x^3 - \frac{1}{x^4} + 2\right) dx =$

(a) $\frac{x^4}{4} + \frac{1}{3x^3} + 2x + C$

(b) $3x^2 + 4x^{-5} + C$

(c) $\frac{x^4}{4} - \frac{3}{x^3} + 2x + C$

(d) $3x^2 - \frac{1}{4x^3} + C$

(e) $\frac{x^4}{4} - \frac{1}{3x^3} + 2x + C$

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15. $\int \frac{(x - \sqrt[3]{x})^2}{\sqrt[3]{x^2}}\, dx =$

(a) $\frac{3}{7}x^{7/3} - \frac{6}{5}x^{5/3} + x + C$

(b) $\frac{3}{7}x^{7/3} - \frac{3}{5}x^{5/3} + x + C$

(c) $\frac{3}{2}x^{2/3} + \frac{6}{5}x^{4/3} + x^2 + C$

(d) $\frac{7}{3}x^{7/3} - x^{4/3} + 2x + C$

(e) $\frac{1}{3}x^3 - \frac{6}{7}x^{7/3} + \frac{3}{5}x^{5/3} + C$

16. $\int \frac{x^2 + 4x - 3}{x - 1}\, dx =$

(a) $\frac{x^2}{2} + 5x + 2\ln|x - 1| + C$

(b) $\frac{7x^2}{2} - 2x + C$

(c) $\frac{x^2}{2} - 6x + 3\ln|x - 1| + C$

(d) $\frac{1}{2}\ln|x - 1| + C$

(e) $3\ln|x - 1| + C$

17. $\int \frac{8x}{(x^2-6)^5}\,dx =$

(a) $-\frac{1}{(x^2-6)^4}+C$

(b) $-\frac{4}{(x^2-6)^5}+C$

(c) $\frac{1}{(x^2-6)^4}+C$

(d) $2(x^2-6)+C$

(e) $\frac{3}{x^2+6}+C$

18. $\int \frac{2}{3x(\ln x)^{2/3}}\,dx$

(a) $2(\ln x)^{1/3}+C$

(b) $\frac{\ln^2 x}{2}+C$

(c) $3\ln x\, e^{2x}+C$

(d) $\frac{e^{x^2}}{2}+C$

(e) $x^2+\frac{1}{x}+C$

19. The marginal cost function is given by $\frac{dc}{dq} = .003q^2 - .4q + 40$ where q is number of units produced. If fixed costs are 500\$, the average cost of producing 10 units is

(a) 88.1 \$

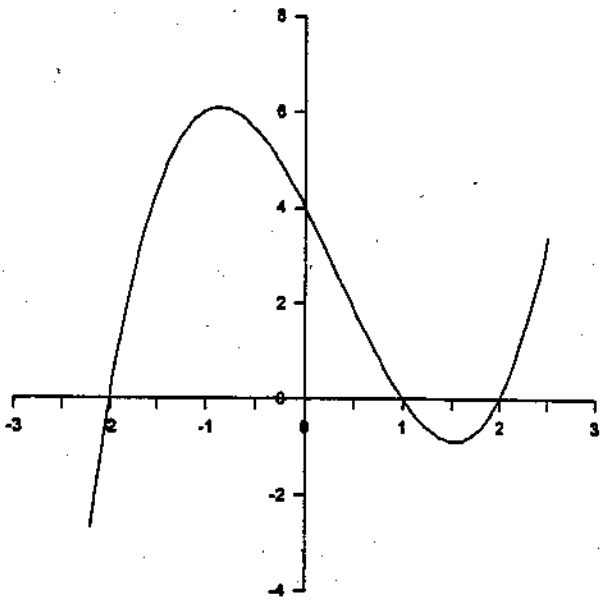
(b) 89 \$

(c) 88 \$

(d) 88.6 \$

(e) 88.7 \$

20. The graph of the derivative f' of a function f is shown. On what interval is f decreasing?



(a) $(-\infty, -2) \cup (+1, 2)$

(b) $(-\infty, -1) \cup (2, \infty)$

(c) $\left(-1, -\frac{3}{2}\right)$

(d) $(-2, +1) \cup (2, \infty)$

(e) $(-2, 2)$

Q	MM	V1	V2	V3	V4
1	a	d	b	b	a
2	a	a	b	b	e
3	a	e	d	d	b
4	a	c	e	e	b
5	a	d	c	b	e
6	a	d	b	a	b
7	a	a	c	b	d
8	a	d	b	d	b
9	a	b	c	a	e
10	a	c	e	a	e
11	a	e	a	e	a
12	a	d	d	d	d
13	a	a	d	c	e
14	a	d	a	c	a
15	a	d	a	b	e
16	a	c	a	d	a
17	a	d	b	e	a
18	a	e	b	d	d
19	a	e	b	b	a
20	a	a	c	a	e