E is none of these

1. Determine: $\lim_{x\to -2} \frac{x^3+8}{x+2}$.

   a) 0 b) 12 c) - 4 d) no limit

2. Find the equation of the line tangent to $f(x)$ at (3, -1) if $\lim_{x\to 3} \frac{f(x)-f(3)}{x-3} = -2$.

   a) $y = -2x + 1$ b) $y = 2x + 7$ c) $y = 2x - 5$ d) $y = -2x + 5$

3. Given: $f(x) = \begin{cases} 3x-1, & x < -1 \\ \frac{x^3+27}{x^2-3x+9}, & -1 \le x < 6 \\ 5, & x > 6 \end{cases}$, find the limit of $f(x)$ at $x = 6$.

   a) 17 b) 9 c) 5 d) 0

4. Find f' if $f(x) = \frac{2x\sin x}{e^x}$.

   a) $f'(x) = \frac{(\sin x - 2x\cos x)}{e^x}$ b) $f'(x) = (\sin x - 2x\cos x)e^x$

   c) $f'(x) = \frac{(\sin x - x\cos x)}{e^x}$ d) $f'(x) = \frac{(\sin x + 2x\cos x)}{e^x}$

5. Find the equation of the line tangent to $f(x) = \sin x - \cos x$ at $(\pi/2, 1)$.

   a) $y = x - \frac{\pi-2}{2}$ b) $y = x + \frac{\pi-2}{2}$ c) $y = x - \frac{\pi+2}{2}$ d) $y = x + \frac{\pi+2}{2}$

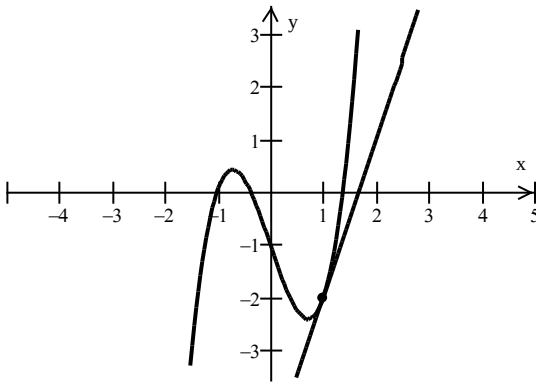
6. Which of the following functions is the graph at the right if the line shown is the tangent to the function at the point (1, -2).

   a) $y = 3x^3 + 2x - 1$

   b) $y = 2x^3 - 3x - 1$

   b) $y = 2x^3 + 3x - 1$

   c) $y = 3x^3 - x - 1$



7. A printer need to make a poster that will have a total area of 200 in² and will have 1 inch margins on the sides, a 2 inch margin on the top and a 1.5 inch margin on the bottom. What height will give the largest printed area?

   a) $10\sqrt{14}$ b) $\frac{20\sqrt{14}}{7}$ c) $5\sqrt{14}$ d) $\frac{45\sqrt{14}}{14}$

8. Which of the following is an asymptote of the function: $f(x) = \frac{x^3-3x^2+3x-5}{x^2-2x+1}$.

   a) $y = x$ b) $y = x + 1$ c) $y = -x$ d) $y = x - 1$

9. According to one model, the velocity of a falling parachutist is given by: $v(t) = v^*(1 - e^{-at})$ where v^* and a are positive constants. Find the $\lim_{t\to\infty} v(t)$.

   a) 0 b) no limit c) v^* d) av^*

10. Find $f''(x)$ if $f(x) = 2\sqrt{1-x^2}$.

    a) $\frac{-4x}{\sqrt{1-x^6}}$ b) $\frac{8x^2}{(1-x^2)\sqrt{1-x^2}}$ c) $\frac{-2\sqrt{1-x^2}}{(1-x^2)^2}$ d) $\frac{8x\sqrt{1-x^2}}{(1-x^2)}$

11. Find the sum of the maximum value and the minimum value $f(x) = x\sqrt{1-x^2}$.

    a) -1 b) 0 c) 1 d) $\frac{\sqrt{2}}{2}$

12. If $x^2 + x^2y^2 + y^3 = 3$, find the derivative of y in respect to x.

    a) $\frac{-(2x+2xy^2)}{(2x^2+3y^2)}$ b) $\frac{(2x-2xy^2)}{(2x^3+3y^2)}$ c) $2x + 2xy^2 + y^3$ d) $\frac{(2x+2xy)}{(2x^2+3y^2)}$

13. Find: $\lim_{x\to-\infty} \frac{2-3x-4x^2}{3x^2+6x+10}$.

    a) $\frac{1}{2}$ b) $-\frac{1}{2}$ c) $\frac{4}{3}$ d) $-\frac{4}{3}$

14. Evaluate: $\lim_{x\to\frac{\pi}{2}} \frac{\tan 2x}{x-\frac{\pi}{2}}$.

    a) 1 b) 2 c) 0 d) ∞

15. Which of the following is the interval where $f(x) = e^x - 3x$ is increasing?

    a) $(-\infty, \infty)$ b) $(0, \ln 3)$ c) $(\ln 3, \infty)$ d) $(-\infty, \ln 3)$

16. Determine f if $f'' = \sin x, f'(\pi) = -2, f(0) = 4$.

a) $f = -\sin x - 3x + 4$ b) $f = -\cos x - x + 5$
c) $f = -\sin x + x + 4$ d) $f = \cos x + x + 3$

17. If $f(t) = at^3 + bt^2 + ct + d$, with $a \neq 0$, find the x – value of its inflection point.

a) $\frac{2a}{b}$ b) $-\frac{b}{3a}$. c) $\frac{2ac}{bd}$ d) $\frac{3abc}{d}$

18. A man in a forest is 2 miles from a straight road. A car is located 5 miles down the road. If the man can walk 3 miles per hour in the forest and 4 miles per hour along the road, toward what point on the road should the man walk to minimize the time needed to walk to the car? (distance from the car)

a) $\frac{2+6\sqrt{7}}{7}$ b) $\frac{5\sqrt{7}+6}{7}$ c) $\frac{5\sqrt{7}-2}{7}$ d) $\frac{35-6\sqrt{7}}{7}$

19. If $lim_{x\to\infty} f(x) = lim_{x\to 0^+} f\left(\frac{1}{x}\right)$, evaluate $lim_{x\to\infty} \frac{\sqrt{1+x^2}}{x}$.

a) -1 b) 0 c) 1 d) ∞

20. Find the interval where $f(x) = 2\sqrt{x} + {}^1/_x$ is concave upward.

a) (2, 3) b) $(\sqrt[3]{16}, \infty)$ c) $(\sqrt[3]{8}, \infty)$ d) (0, ∞)

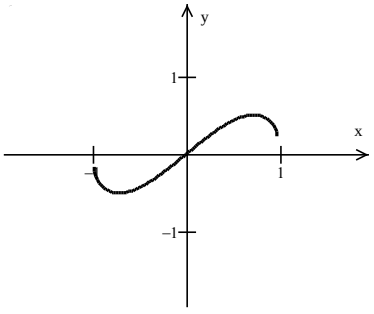
21. Find the minimum value of $f(x) = (x^2 + 3x - 1)^{1/3}$ in the interval [-4, 1].

a) $\frac{\sqrt[3]{13}}{4}$ b) $-\frac{2}{3}$ c) $-\frac{\sqrt[3]{26}}{2}$ d) $-\frac{\sqrt[3]{33}}{3}$

22. A crate open at the top has vertical sides, a square bottom, and a volume of 4 cubic inches. Find the least possible surface area possible for the box.

a) 4 in^2 b) 8 in^2 c) 12 in^2 d) 16 in^2

23. Which of the following functions is the shown in the graph?



a) $f(x) = x^2(1 - x)^{1/3}$

b) $f(x) = \sqrt{|1 - x|}$

c) $f(x) = x(1 - x^2)^{1/2}$

d) $f(x) = \sin^{-1} x$

24. Find the equation of the tangent line to the graph of $g(x) = \frac{x^2+3x-1}{x^2}$ when $x = 2$.

a) $2x + 4y = 13$ b) $13x + 8y = 44$ c) $8x - 12y = 43$ d) $2x + 4y = -10$

25. Suppose the revenue resulting from the sale of x barrels of clover honey is $R(x)$ dollars, where $f(x) = R(x) = 450\sqrt{x}$. Find the marginal revenue at 16 barrel.

a) \$112.50 b) \$84.38 c) \$56.25 d) \$28.13

26. Find $f'\left(\frac{3\pi}{4}\right)$ for the function $f(x) = \sqrt{y}\sec y$.

a) $\frac{2\sqrt{6\pi}+3\pi\sqrt{6\pi}}{6\pi}$ b) $\frac{2\sqrt{6\pi}-3\pi\sqrt{6\pi}}{6\pi}$ c) $\frac{\sqrt{6\pi}-3\pi\sqrt{3\pi}}{3\pi}$ d) $\frac{2\sqrt{3\pi}-3\pi\sqrt{3\pi}}{3\pi}$

27. How many local minimum pts are on the graph of $f(x) = 5x^5 - 3x^2 + x - 10$ between [-5, 6].

a) 0 b) 1 c) 2 d) 3

28. Use implicit differentiation to find the derivative of y in respect to x of $x^4 + xy^3 = 0$ at the point (-1, 1).

a) 0 b) -1 c) 2 d) -3

29. A triangle is formed by the coordinate axes and the line that passes through the point (4, 0) and is tangent to the graph of $y = 1/x$. Find the area of the triangle.

a) 4 b) 2 c) 1 d) $\frac{1}{2}$

30. Which of the following is true of the following: $\lim_{x\to 0^+} \frac{\sin 2x - 2\sqrt{x}\sin x + x^2}{x}$.

a) ∞ b) 0 c) 1 d) 2

Tie-Breakers:

1. Find y'' if $xy + x = 2$.

2. Find the line tangent to $f(x) = -x\sqrt{1+3x^2}$ at the point (1, -2).

3. Find all horizontal asymptotes of $f(x) = \frac{\sqrt{2+4x^2}}{x}$.