Final Exam Review AP Calculus AB Name_____

1. What is the x-coordinate of the point of inflection on the graph $y = 3x^3 + 6x^2 + 12$?

(A) 5 (B) 0 (C) $-\frac{2}{3}$ (D) -5 (E) -10

2. $\lim_{n\to\infty} \frac{n^3 - 5n}{n^3 - 2n^2 + 1} =$

(A) -5 (B) -2 (C) 1 (D) 3 (E) nonexistent

3. If $x + 2xy - y^2 = 2$, then at the point $(1,1)$, $\frac{dy}{dx} =$

(A) $-\frac{3}{2}$ (B) 0 (C) $\frac{1}{2}$ (D) $\frac{3}{2}$ (E) nonexistent

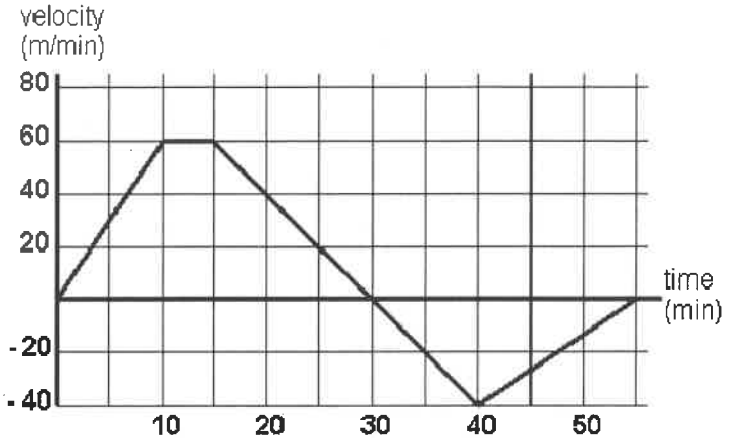
4. A particle moves along the x-axis so that its position at time t is given by $s(t) = 2t^2 + 8t + 2$. What is the acceleration of the particle when $t = 4$?

(A) 0 (B) 2 (C) 4 (D) 8 (E) 12

5. Evaluate: $\lim_{x\to 2} \frac{4 - x^2}{x^2 + x - 6}$

(A) $-\frac{4}{5}$ (B) $-\frac{6}{7}$ (C) 0 (D) $\frac{8}{11}$ (E) $\frac{8}{3}$

Use the figure below to answer #6 and #7



6. An ant begins to crawl up a vertical wire at time $t = 0$. The velocity v of the bug at time t, $0 \le t \le 55$, is given by the function whose graph is shown above. At what value of t does the ant change direction?

(A) 20 (B) 40 (C) 30 (D) 10 (E) 50

7. What is the total distance the bug traveled from $t = 0$ to $t = 55$?

(A) 1400 (B) 1300 (C) 1100 (D) 1450 (E) 1550

8. If $f(x) = \cos^{-1} x$, then $f'(\frac{1}{2}) =$

(A) $\frac{2\sqrt{3}}{3}$ (B) $\frac{4}{5}$ (C) $-\frac{4}{5}$ (D) $-\frac{2\sqrt{3}}{3}$ (E) $\frac{\pi}{2}$

9. An equation of the curve f(x) when $f'(x) = 3x^2 - 2x$ at the point (0, -2) is

(A) $f(x) = 6x - 6$ (B) $f(x) = 6x - 8$ (C) $f(x) = x^3 - \frac{x^2}{2} - 1$

(D) $f(x) = x^3 - x^2 - 2$ (E) $f(x) = x^3 + \frac{x^2}{2} - 5$

10. $\frac{d}{dx}\left(\frac{5}{2+x^2}\right)=$

(A) $\frac{-10x}{\left(2+x^2\right)^2}$ (B) $\frac{3x}{\left(2+x^2\right)^2}$ (C) $\frac{6x}{\left(2+x^2\right)^2}$

(D) $\frac{-3}{\left(2+x^2\right)^2}$ (E) $\frac{3}{2x}$

11. If $F(x)=\int_0^{x^2}\sqrt{2t^2+1}\,dt$, then $F'(1)=$

(A) -3 (B) -2 (C) $2\sqrt{3}$ (D) 3 (E) 18

12. If $f(x)=x\sqrt{2x+1}$, then $f'(x)=$

(A) $\frac{3x+1}{\sqrt{2x+1}}$ (B) $\frac{x}{\sqrt{2x-3}}$ (C) $\frac{-x+3}{\sqrt{2x-3}}$

(D) $\frac{1}{\sqrt{2x-3}}$ (E) $\frac{5x-6}{\sqrt{2x-3}}$

13. An equation of the line tangent to $y=x^3+3x^2+2$ at its point of inflection is

(A) $y-7=-2(x+\frac{1}{2})$ (B) y = 3x + 1 (C) y = 2x + 10

(D) y = 3x - 1 (E) $y-4=-3(x+1)$

14. Integrate: $\int_1^4 \frac{2}{x^4}\,dx$

(A) $-\frac{1}{2}$ (B) $\frac{21}{32}$ (C) $\frac{1}{2}$ (D) 1 (E) $2\ln 2$

15. The absolute maximum value of $f(x) = x^{\frac{2}{3}}$ on the closed interval [-2, 3] occurs at $x =$

(A) -2 (B) 0 (C) 1 (D) 3 (E) 4

16. If $f(x) = \ln x$, then $f'(e^3) =$

(A) $\frac{1}{4e}$ (B) $\frac{1}{e^3}$ (C) $\frac{2}{2e}$ (D) 1 (E) $\sqrt{e}$

17. At $x = 3$, the function given by $f(x) = \begin{cases} 3x^2, & x < 3 \\ 18x - 9, & x \geq 3 \end{cases}$ is

(A) undefined

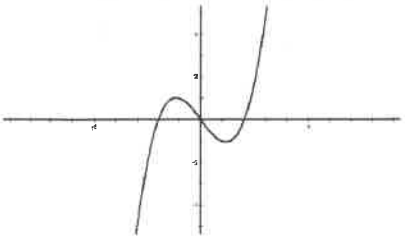
(B) continuous but not differentiable

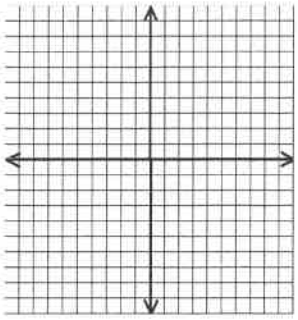
(C) differentiable but not continuous

(D) neither continuous nor differentiable

(E) both continuous and differentiable

18. Sketch the derivative of:





19. If $x^3 + y^3 = 18xy$, then in terms of x and y, $\frac{dy}{dx} =$

(A) $-\frac{x^2+y}{x+2y^2}$ (B) $-\frac{x^2+y}{x+y^2}$ (C) $-\frac{x^2+y}{x+2y}$

(D) $-\frac{x^2+y}{2y^2}$ (E) $\frac{6y-x^2}{y^2-6x}$

20. What is the average value of $y = 4 - x^2$ on the interval [0, 3]?

(A) $\frac{26}{9}$ (B) $\frac{52}{9}$ (C) 1 (D) 4 (E) 24

21. If $y = \frac{x^2}{1-x^3}$, find y'(2)

(A) -.399 (B) .408 (C) 1 (D) 0 (E) .254

22. Find a value of c such that the conclusion of the mean value theorem is satisfied for

$f(x) = x^2 + 2x - 1$ on the interval [0 , 1].

(A) $\sqrt{\frac{1}{2}}$ (B) $\frac{1}{2}$ (C) $2\sqrt{\frac{1}{3}}$ (D) -1 (E) $2\sqrt{3}$

23. A 10 foot ladder is placed against a wall. If the bottom of the ladder is moving away from the wall at 2 feet per second, at what rate is the top moving down when the top of the ladder is 6 feet up the wall?

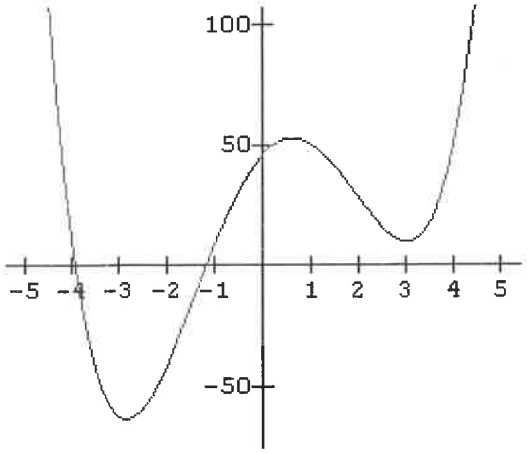
(A) 1.25 (B) 1.5 (C) -1.33 (D) -2.66 (E) 2.75

24. A rectangular canal, 5m wide and 100m long has an uneven bottom. Depth measurements are taken at every 20m along the length of the canal. Use these depth measurements to construct a Riemann sum with five subintervals using right endpoints to estimate the volume of water in the canal.

Distance	0 m	20m	40m	60m	80m	100m
Depth	2 m	1.6 m	1.8 m	2.1 m	2.1m	1.9 m

(A) 1010 (B) 950 (C) 860 (D) 990 (E) 190

25. The graph of function h is shown below. How many zeros does the first derivative (h') of h have?



A) 1 B) 2 C) 3 D) 4 E) 5

26. Function f is defined by $f(x)=\begin{cases} x^2-a^2x & if \ \ x<2 \\ 4-2x^2 & if \ \ x\geq 2 \end{cases}$

where a is a constant. What must the value of "a" be equal to for function f to be continuous at $x=2$?

A) 0 B) ¼, -1/4 C) 4,-4 D) 1,-1 E) 2,-2

27. What is $\frac{d}{dx}\sin^2(3x-2)$

(A) $6\sin(3x-2)\cos(3x-2)$ (B) $6x^2\cos(3x-2)$ (C) $sin^2(3x-2)$

(D) $-6x^2\sin(3x-2)\cos(3x-2)$ (E) $-2\sin(3x-2)\cos(3x-2)$

28. $\int_0^1 (x^2+\sqrt{x})dx$

(A) 0 (B) 1 (C) 16/15 (D) 7/5 (E) 2

29. The graph of $y=-x^4+4x^3-4x+1$ is concave down for

(A) $x<0$ (B) $x>0$ (C) $x<0$ or $x>2$ (D) $x<2/3$ or $x>2$ (E) $2/3<x<2$

30. If $y=3x^3-2x^{-3}+1$, then $f'(-1)=$

(A) 3 (B) 13 (C) -1 (D) 15 (E) -5