

AB Semester Review

1. $\lim_{x \rightarrow 2} (-x^2 + 4x) = -4 + 8 = 4$

E

2. $\lim_{x \rightarrow 1} f(x) = \text{DNE}$ $\lim_{x \rightarrow 1^-} f(x) = 3(1) - 2 = 1$

$\lim_{x \rightarrow 1^-} f \neq \lim_{x \rightarrow 1^+} f$

$\lim_{x \rightarrow 1^+} f(x) = 2(1)^2 = 2$

D

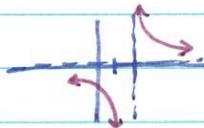
3. $\lim_{x \rightarrow 1} f(x) = \lim_{x \rightarrow 1} \frac{x-1}{(x-1)(x+1)} = \frac{1}{2}$

B

4. $\lim_{x \rightarrow -1} \frac{(x-6)(x+1)}{x+1} = -7$

C

5. $\lim_{x \rightarrow 2^-} \frac{1}{x-2} = -\infty$



D

6. $\frac{x+1}{(x-1)(x+1)}$

horizontal @ $x = 0$

vertical @ $x = 1$

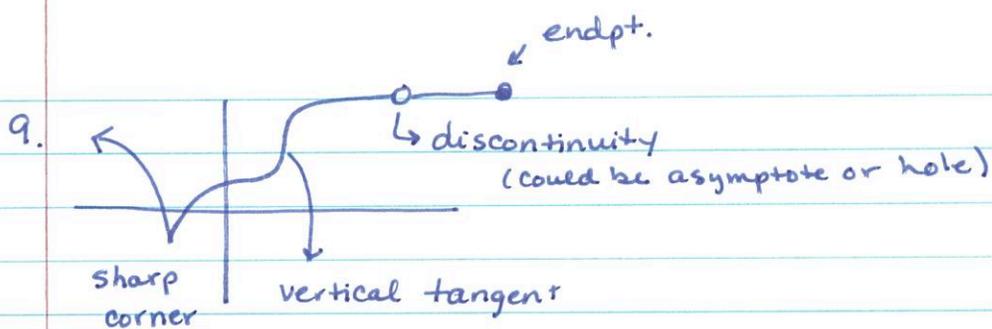
7. $\frac{0}{0}$ $\lim_{x \rightarrow \infty} \frac{2x^4 + 6x^2 + 5}{3 + x^4} = \frac{2}{1} = 2$

D

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

C

$f' = 3x^{-2}$



10. $f = x^{-3}$

$$f' = -3x^{-4}$$

C

11. $\frac{dw}{dn} = \frac{-9}{2} n^{-2} =$

$$\frac{-9}{2n^2}$$

$$w = \frac{9}{2} n^{-1}$$

12. $v(t) = s'(t) = 6t + 2$

$$v(2) = s'(2) = 10$$

E

13. $f = t^2 + 2t^{-1}$

$$f' = 2t - 2t^{-2}$$

C

$$f'(-2) = -4 - \frac{2}{4} = -\frac{9}{2}$$

14. $f' = \frac{3}{2} x^{1/2} = \frac{3\sqrt{x}}{2}$

$$f'(4) = \frac{3 \cdot 2}{2} = 3$$

C

$$15. \frac{dy}{dx} = \frac{(x-1) \cdot 1 - (x+3) \cdot 1}{(x-1)^2} = -4(x-1)^{-2}$$

$$\frac{d^2y}{dx^2} = 8(x-1)^{-3} \cdot 1 = \frac{8}{(x-1)^3} \quad \text{D}$$

$$16. f' = 7(2x^2+5)^6 \cdot 4x$$

E

$$17. y' = 72x^2 + 12x - 12$$

$$y' = 12(6x^2 + x - 1)$$

$$0 = 12(3x-1)(2x+1)$$

$$\text{@ } x = \frac{1}{3}, -\frac{1}{2}$$

B

18.

C

$$19. 2x + 6y \frac{dy}{dx} = 0$$

$$y - 1 = -\frac{1}{3}(x - 1)$$

$$\frac{dy}{dx} = \frac{-x}{3y} \Big|_{(1,1)} = -\frac{1}{3}$$

D

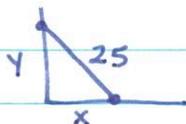
$$20. x \cdot 2y \frac{dy}{dx} + y^2 - \frac{dy}{dx} = 3x^2$$

$$\frac{dy}{dx} (2xy - 1) = 3x^2 - y^2$$

C

$$\frac{dy}{dx} = \frac{3x^2 - y^2}{2xy - 1}$$

21.



$$\frac{dy}{dt} = -4 \frac{\text{ft}}{\text{min}}$$

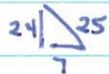
$$\frac{dx}{dt} \Big|_{y=24} = ?$$

$$x^2 + y^2 = 25^2$$

$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 0$$

$$7 \left(\frac{dx}{dt} \Big|_{y=24} \right) + 24(-4) = 0$$

$$\frac{dx}{dt} \Big|_{y=24} = \frac{96}{7}$$



* The ladder is moving away from the wall at 13.714 ft/min when $y = 24$. *

$$22. \quad y' = 2 \sec(2x) \cdot \sec(2x) \tan(2x) \cdot 2$$

$$= 4 \sec^2(2x) \tan(2x)$$

$$s: ()^2$$

$$c: \sec()$$

$$p: 2x$$

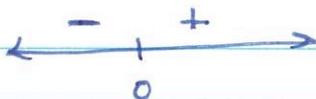
23. f is increasing when f' is positive.

$$f' = 4x^3 + 2x$$

$$0 = 2x(2x^2 + 1)$$

↓
imag.

$$CV @ x = 0$$



C

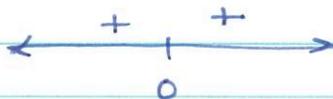
$$24. \quad f = 1 + x^{-2}$$

$$f' = -2x^{-3}$$

$$f'' = 6x^{-4} = \frac{6}{x^4}$$

PPOI when $f'' = 0$

$$\therefore @ x = 0$$



C

25. cont. on $(-2, 0]$? NO

diff on $(-2, 0)$? NO

$f(-2) = f(0)$? yes

D

26. $f = e^{\ln x^6} = x^6$

$f' = 6x^5$

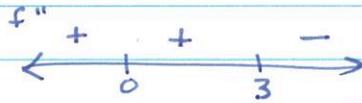
E

27. $y' = 20x^3 - 5x^4$

$y'' = 60x^2 - 20x^3$

$0 = 20x^2(3-x)$

PPoI @ $x = 0, 3$



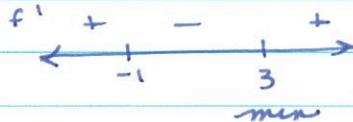
PoI @ $x = 3$

B

28. $f' = x^2 - 2x - 3$

$0 = (x-3)(x+1)$

CV @ $x = -1, 3$



D

29. AROC:

$\frac{f(3) - f(0)}{3 - 0} = \frac{54 - 0}{3} = 18$

$6x^2 = 18$

$x = \pm\sqrt{3}$

IROC:

$f' = 6x^2$

$C = \sqrt{3}$

30. $a^u \cdot du \cdot \ln a$

$a = 2$

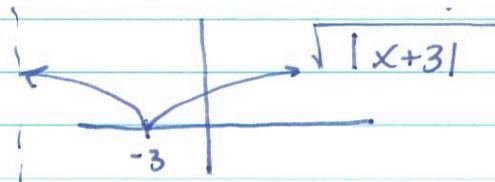
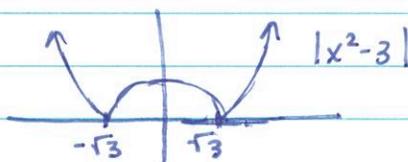
$u = 3x$

$du = 3$

$2^{3x} \cdot 3 \cdot \ln 2$

C

31.



32.



D

33.

$$u = x + 2 + e^{-4x}$$

$$du = 1 - 4e^{-4x}$$

$$f' = \frac{1 - 4e^{-4x}}{x + 2 + e^{-4x}}$$

34.

$$u = e^{2x}$$

$$du = 2e^{2x}$$

$$y' = \frac{2e^{2x}}{\sqrt{1 - e^{4x}}}$$

A

$$35. \quad y' = \frac{2^x \cdot 2x - x^2 \cdot 2^x \ln 2}{2^{2x}}$$

$$= \frac{2x - x^2 \ln 2}{2^x}$$

D

$$36. \quad g'(2) = \frac{1}{f'(1)} = \frac{1}{4}$$

B

$$f' = 3x^2 + 1$$

$$f'(1) = 4$$

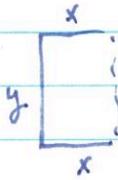
37. a. Candidates test (endpts + cv)

b. f' sign chart + to - max
 - to + min

c. Yes } local = relative

d. Yes } absolute = global

38.



$$2x + y = 100$$

$$y = 100 - 2x$$

$$A = x \cdot y$$

$$A = x(100 - 2x)$$

$$A = 100x - 2x^2$$

$$A' = 100 - 4x$$

$$A' = 0 \text{ when } x = 25$$

B

39.

$$\frac{dr}{dt} = \frac{2 \text{ cm}}{\text{sec}}$$

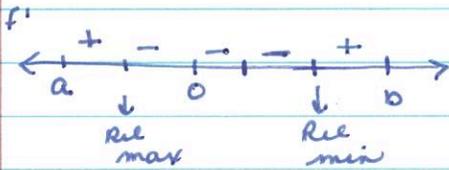
$$\frac{dv}{dt} = 4\pi r^2 \frac{dr}{dt}$$

$$\left. \frac{dv}{dt} \right|_{r=10} = ?$$

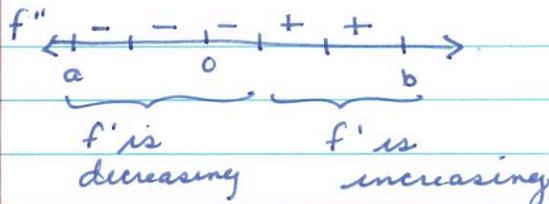
$$\left. \frac{dv}{dt} \right|_{r=10} = 4\pi (100) 2$$

D

40.

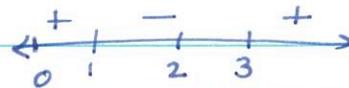


D



$$41. a. v(t) = x'(t) = 3t^2 - 12t + 9$$

$$v(0) = 9$$

b. opt when $v' < 0$

$$\therefore (1, 3)$$

$$3(t-3)(t-1)$$

c.

t	x(t)
0	11
1	15
2	13

$$11 > 4$$

$$15 > 2$$

$$13$$

6d) speed = $|v(t)|$

speed is increasing

when $v(t) + a(t)$

have the same signs

$$v(4) > 0$$

 \therefore yes.

$$a(4) = 6(4) - 12 > 0$$