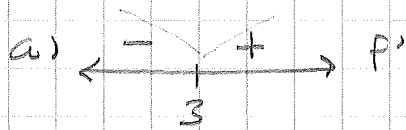


B-#5

1. $f'(x) = (x-3)e^x$ $f(1) = 7$



$y = f(x)$ has a rel min at $x=3$ since $f'(x)$ changes from neg to pos at $x=3$.

b) $f''(x) = e^x(1) + (x-3)e^x$
 $= e^x(1+x-3)$
 $= e^x(x-2)$



f dec and CV on $(2,3)$ since $f' < 0$ and $f'' > 0$ on that interval.

c) $f(3) = f(1) + \int_1^3 f'(x) dx$

$\int x e^x - 3e^x dx$
 $= \int x e^x dx - 3 \int e^x dx$
 $x e^x - e^x - 3e^x + C$
 $x e^x - 4e^x$

$f(3) = 7 + [x e^x - 4e^x]_1^3$
 $7 + 3e^3 - 4e^3 - e + 4e$
 $7 - e^3 + 3e$

2. $g(x) = x^4 + 4x^3$
 $g'(x) = 4x^3 + 12x^2$
 $4x^2(x+3)$

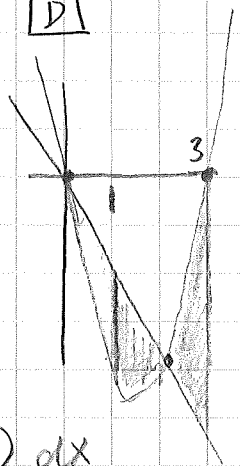
-3	0	
-	+	

B
 only at $x=-3$

3. $\lim_{x \rightarrow 1} \frac{x^2 - 1}{\sin(\pi x)} = \frac{0}{0}$ B
 LH $\lim_{x \rightarrow 1} \frac{2x}{\pi \cos(\pi x)} = \frac{2}{\pi(-1)} = -\frac{2}{\pi}$

4. $y = \left(\frac{x}{x+5}\right)^5$
 $\frac{dy}{dx} = 5 \left(\frac{x}{x+5}\right)^4 \cdot \frac{(x+5) \cdot 1 - x \cdot 1}{(x+5)^2}$
 $= \frac{5x^4(1)}{(x+5)^6}$ D

5. $y = 6x^2 - 18x$
 $y = 6x(x-3)$
 $6x^2 - 18x = -6x$
 $6x^2 - 12x = 0$
 $6x(x-2) = 0$



$\int_1^2 -6x - (6x^2 - 18x) dx$
 $+ \int_2^3 (6x^2 - 18x) - (-6x) dx$
 $\int_1^2 -6x^2 + 12x dx + \int_2^3 (6x^2 - 12x) dx$
 $-6 \int_1^2 x^2 - 2x dx + 6 \int_2^3 x^2 - 2x dx$
 $-6 \left[\frac{1}{3}x^3 - x^2 \right]_1^2 + 6 \left[\frac{1}{3}x^3 - x^2 \right]_2^3$
 $-6 \left[\frac{8}{3} - 4 - \frac{1}{3} + 1 \right] + 6 \left[9 - 9 - \frac{8}{3} + 4 \right]$
 $-6 \left[\frac{7}{3} - 3 \right] + 6 \left[-\frac{8}{3} + 4 \right]$
 $6 \left[-\frac{7}{3} + 3 - \frac{8}{3} + 4 \right]$
 $6 \left[-\frac{15}{3} + 7 \right]$
 $-30 + 42 = 12$ B

6. $y = \ln(1-x)$ $x = -1$
 $y(-1) = \ln(2)$
 point $(-1, \ln(2))$
 $y'' = \frac{1}{1-x} \cdot -1$
 $y'(-1) = \frac{-1}{2}$

B

7.

x	y	m	Δx	Δx
2	3	-0.5	0.2	-0.1
2.2	2.9	-0.3	0.2	-0.06
				2.84

C

8. $\int_0^4 \frac{x}{\sqrt{x^2+9}} dx$ $u = x^2+9$
 $du = 2x dx$
 $\frac{1}{2} du = x dx$

$\frac{1}{2} \int_9^{25} u^{-1/2} du$

$\frac{1}{2} \left[2 u^{1/2} \right]_9^{25}$

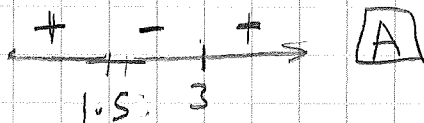
$\frac{\sqrt{25} - \sqrt{9}}{5-3} = \frac{2}{2} = 1$

D

9. $\int x^2 \sin x dx$ $u = x^2$ $v = -\cos x$
 $-x^2 \cos x + \int 2x \cos x dx$ $du = 2x dx$ $dv = \sin x dx$

B

10. $g'(x) = f(x) f'(x) (x-3)$
 $f(x) = 3-2x$
 $f'(x) = -2$
 $g'(x) = -2 \cdot (3-2x)(x-3)$



A

11. Slopes are undefined at $x=0$ (the segments on the y -axis must be vertical)
 when $x=y$ $m=0$

A

12. $\cos(x/2) = 1/2$
 $-\sin(x/2)(x \cdot y' + y) = 1/2$
 $-\sin(\pi/2)(\pi/2 y' + 1) = 1/2$
 $-1 \cdot \pi/2 y' - 1 = 1/2$
 $-1 = y' + \pi/2 y'$
 $-1 = y'(1 + \pi/2)$
 $\frac{-1}{1 + \pi/2} = y'$
 $\frac{-2}{2 + \pi} = y'$

B

13. $f(x) = 1/x$ $[4, 6]$
 $avg = \frac{1}{6-4} \int_4^6 \frac{1}{x} dx$
 $= \frac{1}{2} \ln(x) \Big|_4^6$
 $\frac{1}{2} [\ln(6) - \ln(4)]$
 $\frac{1}{2} [\ln(3/2)]$

C

14. $\int_x^2 t^3 dt$
 $\left[\frac{1}{4} t^4 \right]_x^2$
 $4 - \frac{1}{4} x^4 = 0$
 $-\frac{1}{4} x^4 = -4$
 $x^4 = 16$
 $x = \pm 2$

D

15. $\frac{3}{x(x+1)} = \frac{A}{x} + \frac{B}{x+1}$
 $3 = A(x+1) + Bx$ $x = -1$
 $3 = 0(-1) + B(-1)$
 $-3 = B$
 $3 = A(1) + 0$ $x = 0$
 $3 = A$

$\frac{1}{3} \int \frac{1}{x} - \frac{1}{x+1} dx$
 $3(\ln|x| - \ln|x+1|) + C$

D

$$16. \lim_{h \rightarrow 0} \frac{e^{-1-h} - e^{-1}}{h}$$

$$\text{L'H} \left(\lim_{h \rightarrow 0} \frac{e^{-1-h} - 0}{1} = -e^{-1} \right) \quad \boxed{B}$$

$$17. f(x) = x^3 - 2x^2 + 5x - 16$$

$$f'(x) = 3x^2 - 4x + 5$$

$$\frac{f(5) - f(0)}{5 - 0} = \frac{125 - 50 + 25 - 16 - (-16)}{5}$$

$$= \frac{100}{5} = 20$$

$$3x^2 - 4x + 5 = 20$$

$$3x^2 - 4x - 15 = 0 \quad \boxed{D}$$

$$(3x+5)(x-3) = 0$$

$$x = -5/3 \quad \boxed{x=3}$$

$$18. \int_0^3 |v(t)| dt$$

$$\int_0^2 v(t) dt - \int_2^3 v(t) dt$$

$$[x(t)]_0^2 - [x(t)]_2^3$$

$$x(2) - x(0) - (x(3) - x(2))$$

$$20/3 - 0 - 6 + 20/3 = \boxed{22/3}$$

$$x(t) = \frac{1}{3}t^3 - 3t^2 + 8t$$

$$x(2) = 20/3 \quad \boxed{D}$$

$$x(0) = 0$$

$$x(3) = 6$$

$$19. \frac{dy}{dx} = \frac{x+1}{y}$$

$$y dy = (x+1) dx$$

$$\frac{1}{2}y^2 = \frac{1}{2}x^2 + x + C$$

$$y^2 = x^2 + 2x + C \quad (0, -2)$$

$$4 = 0 + 0 + C$$

$$4 = C$$

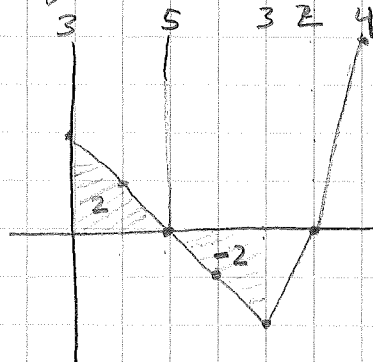
$$y^2 = x^2 + 2x + 4$$

$$y = \pm \sqrt{x^2 + 2x + 4}$$

$$y = -\sqrt{x^2 + 2x + 4} \quad \boxed{E}$$

20. D

$$21. g(2) = 5$$



$$g(0) = 3 \quad \boxed{D}$$

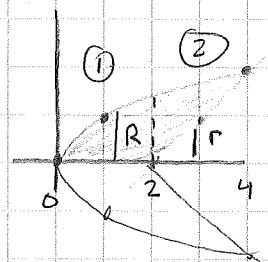
$$g(4) = 3$$

$$g(5) = 2$$

$$g(6) = 4$$

> 3 some where between $x=5$ & 6

22.



$$\textcircled{1} \pi \int_0^2 \sqrt{x}^2 dx$$

$$\textcircled{2} \pi \int_2^4 (\sqrt{x})^2 - (x-2)^2 dx$$

$$\textcircled{1} + \textcircled{2} = \pi \int_0^2 x dx + \int_2^4 (x - (x-2)^2) dx \quad \boxed{D}$$

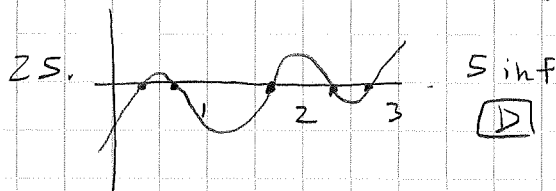
$$23. t = f(p) \quad \boxed{D}$$

$$\frac{dt}{dp} = f'(p) \quad \text{hours / psi}$$

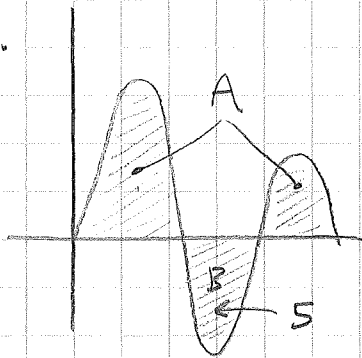
$$24. f(5) = f(2) + \int_2^5 f'(x) dx$$

$$= 4 + 28.605$$

$$= 29.605 \quad \boxed{A}$$



26.



$$A + B = 13$$

$$A - B = 3$$

$$2A = 16$$

$$A = 8$$

$$\int_2^4 v(t) dt = -5 \quad \boxed{B}$$

$$27. \quad 4B + \int_0^4 E(t) - L(t) dt = 82.749 \quad \boxed{B}$$

$$28. \quad \frac{1}{2 - 1.25} \int_{1.25}^2 \tan\left(\frac{x^2}{a}\right) dx$$

$$\frac{1}{.75} (0.232) = .3099 \quad \boxed{C}$$

$$29. \quad \lim_{x \rightarrow 5} (\ln f(x) + 3 \ln g(x))$$

$$\lim_{x \rightarrow 5} \ln f(x) + 3 \lim_{x \rightarrow 5} \ln g(x)$$

$$4 + 3(5)$$

$$19 \quad \boxed{A}$$

B-45 Answers

2. B

16. B

3. B

17. D

4. D

18. D

5. B

19. C

6. B

20. D

7. C

21. D

8. D

22. D

9. B

23. D

10. A

24. A

11. A

25. D

12. B

26. B

13. C

27. B

14. D

28. C

15. D

29. A