AP Calculus Practice Exam

AB Version – Section 1 – Part A

Calculators are NOT permitted on this portion of the exam. 28 questions = 55 minutes

plug in composition

1. Give f(g(-2)), given that f(x) = x – 2, g(x) = $\frac{x}{x^2+1}$

   a. $\frac{-11}{5}$ b. $\frac{-4}{17}$ c. -3 d. $\frac{14}{85}$ e. $\frac{-12}{5}$

$g(-2) = \frac{-2}{(-2)^2+1} = \frac{-2}{4+1} = \frac{-2}{5}$

$f(-\frac{2}{5}) = -\frac{2}{5} - \frac{2 \cdot 5}{1 \cdot 5} = -\frac{2}{5} - \frac{10}{5} = -\frac{12}{5}$

derivative

2. Find the slope of the tangent line to the graph of f at x = 4, given that f(x) = $x^2 - 6\sqrt{x}$

   a. $\frac{11}{2}$ b. $\frac{17}{2}$ c. $\frac{19}{2}$ d. $\frac{13}{2}$ e. $\frac{9}{2}$

$x^2 - 6x^{1/2}$

$2x - 6 \cdot \frac{1}{2} \frac{1}{\sqrt{x}}$

$2x - \frac{3}{\sqrt{x}} = 2 \cdot 4 - \frac{3}{\sqrt{4}} = \frac{8}{1} - \frac{3}{2} = \frac{16}{2} - \frac{3}{2} = \frac{13}{2}$

leading terms

3. Determine $\lim_{x\to\infty} \frac{3x^3+x}{4x^5+3x^2-2}$

   a. 1 b. $\frac{3}{4}$ c. $\frac{9}{20}$ d. 0 e. ∞

$\frac{3x^3}{4x^5} = \frac{3}{4x^2} \quad \frac{3}{\infty} = 0$ at $x \to \infty$

4. f(x) = x^3. A region is bounded between the graphs of y = -1 and y = f(x) for x between -1 and 0, and between the graphs of y = 1 and y = f(x) for x between 0 and 1. Give an integral that corresponds to the area of this region.

   a. $\int_{-1}^{1} 1 + x^3\, dx$ b. $\int_{-1}^{1} 1 - x^3\, dx$ c. $\int_{0}^{1} 2(1 + x^3) dx$

   d. $\int_{0}^{1} -x^3 - 1\ dx$ e. $\int_{0}^{1} 2(1 - x^3)\, dx$

derivative find $\frac{dy}{dx}$

5. Given that $5x^3 - 3xy - 2y^2 = 1$, determine the change in y with respect to x.

   a. - $\frac{15x^2-3}{-3x-4y}$ b. - $\frac{15x^2-3y}{-3-4y}$ c. - $\frac{15x^2-3y}{-3x-4y}$ d. - $\frac{15x^2-3}{-3-4y}$ e. - $\frac{10x-3y}{-3x-2}$

$\frac{d(5x^3)}{dx} - \frac{d(3xy)}{dx} - \frac{d(2y^2)}{dx} = \frac{d(1)}{dx}$

$15x^2 - 3[x\frac{dy}{dx} + y\frac{dx}{dx}] - 4y\frac{dy}{dx} = 0$

$15x^2 - 3x\frac{dy}{dx} - 3y - 4y\frac{dy}{dx}$

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

derivative

6. Compute the derivative of -3secx + 5cscx

   a. $-3\tan^2 x - 5\cot^2 x$ b. $-3\sec^2 x - 5\csc^2 x$ c. -3secxtanx + 5cscxcotx

   d. -3secxtanx – 5cscxcotx e. -3cscx – 5 secx

$-3\frac{d}{dx}\sec x + 5\frac{d}{dx}\csc x$

$-3 \cdot \sec x \tan x + 5 \cdot (-\csc x \cot x)$

$-3\sec x \tan x - 5\csc x \cot x$

7. Compute $\int_{0}^{\frac{1}{4}} \frac{16}{1+16t^2}\ dt$

   a. 4π b. 3π c. 0 d. –π e. π

$$\frac{2x^4+4y \, \frac{d}{dx}(2x^4-4x) - 2x^4-4x \, \frac{d}{dx}(2x^4+4y)}{(2x^4+4x)^2}$$

derivative quotient rule

8. Determine $\frac{d}{dx}\frac{2x^4-4x}{2x^4+4x}$

a. $\frac{48x^2-1}{(2x^3+4)^2}$ b. $\frac{12x^2}{(x^3+2)^2}$ c. $\frac{24x^2-1}{(2x^3+4)^2}$ d. $\frac{24x^2}{(2x^3+4)^2}$ e. $\frac{12x^2}{(2x^3+4)^2}$

$(2x^4+4x)(8x^3-4) -$
$(2x^4-4x)(8x^3+4)$
$16x^7-8x^4+32x^4-16x$
$-(16x^7+8x^4-32x^4-16x)$
$-16x^4+64x^4$

$\frac{48x^4}{(2x^4+4x)^2}$

$4x^8+16x^5+16x^2$

$\frac{48x^4}{4x^2(x^6+4x^3+4)}$

$\frac{12x^2}{(x^3+2)^2}$

derivative to find slope

perpendicular line

9. Give the equation of the normal line to the graph of y = $4x\sqrt{x^2+4}$ - 2 at the point (0, -2).

a. 8x + y = -2 b. x – 8y = 16 c. x + 8y = -16 d. -8x + y = -2 e. x + 8y = -2

f'' y''>0 concave up y''<0 concave down

10. Determine the concavity of the graph of f(x) = 4sinx + 4cos²x at x = π

a. -8 b. -6 c. -11 d. 4 e. 8

11. Compute $\int 4x^2\sqrt{x^3+3}$ dx.

a. $\frac{16}{9}(x^3+3)^{3/2}$+ c b. $\frac{8}{9}(x^3+3)^{3/2}$ + c c. $\frac{8}{3}(x^3+3)^{3/2}$ + c d. $\frac{4}{3\sqrt{x^3+3}}$ + c e. $\frac{8}{3\sqrt{x^3+3}}$ + c

derivative =0 to min

12. Give the value of x where the function f(x) = $x^3 + \frac{15}{2}x^2$ + 12x – 2 has a local minimum.

a. 1 b. -1 c. -4 d. 4 e. -3

lower point than x = -4

derivative = 4 if x=0 find y

13. The slope of the tangent line to the graph of $-3x^2 + cx - 3e^y = -3$ at x = 0 is 4. Give the value of c.

a. -6 b. 6 c. -3 d. -12 e. 12

14. Compute $\int 2^x - 4e^{2lnx}$ dx

a. 2^xln2 - $\frac{2e^{2lnx}}{x}$ + c b. 2^xln2 – $2e^{2lnx}$ + c c. $\frac{2^x}{ln2}$ - $\frac{4}{3}x^3$+ c d. $\frac{2^x}{ln2}$ – $2e^{2lnx}$ + c e. $\frac{2^x}{ln2}$ – $2x^2$ + c

15. What is the average value of the function g(x) = $(2x + 4)^2$ on the interval from x = -4 to x = -1?

a. -4 b. 4 c. 10 d. 12 e. 6

derivative of tanx

16. Compute $\lim_{t\to0}\frac{\tan\left(\frac{1}{4}\pi+t\right)-\tan\frac{1}{4}\pi}{t}$

a. -1 b. 2 c. ¼ π d. π e. 1

derivative of tanx at x = π/4

$\frac{d}{dx}\tan x = \sec^2 x = \frac{1}{\sin^2 x} = \frac{1}{\sin^2\frac{\pi}{4}} = \frac{1}{\left(\frac{\sqrt{2}}{2}\right)^2} = \left(\frac{2}{\sqrt{2}}\right)^2 = \frac{4}{2} = \boxed{2}$

derivative

17. Find the instantaneous rate of change of $f(t) = (3t^3 - 4t + 4)\sqrt{t^2 + 3t + 4}$ at $t = 0$.

a. $\frac{-3}{2}$ b. -8 c. -6 d. -5 e. -1

derivative

18. Compute $\frac{d}{dx}7^{\cos x}$

a. $-\sin x 7^{\cos x}\ln 7$ b. $\sin x 7^{\cos x}\ln 7$ c. $-\sin x 7^{\cos x}$ d. $-\frac{\sin x\, 7^{\cos x}}{\ln 7}$ e. $\frac{\sin x\, 7^{\cos x}}{\ln 7}$

19. A solid is generated by rotating the region enclosed by the graph of $y = \sqrt{x}$, the lines $x = 1$, $x = 2$, and $y = 1$, about the x-axis. Which of the following integrals gives the volume of the solid?

a. $\int_1^2 \pi(x-1)^2\,dx$ b. $\int_1^2 \pi(x-1)\,dx$ c. $\int_1^2 \pi(\sqrt{x}-1)^2\,dx$ d. $\int_1^2 \pi(2-x)^2\,dx$

e. $\int_1^2 \pi(2-\sqrt{x})^2\,dx$

20. Compute $\lim_{x\to 0} \frac{2x}{\sin 3x} + \frac{x}{\cos 3x}$

a. $\frac{2}{3}$ b. undefined c. 0 d. $\frac{1}{3}$ e. ∞

21. Given $y > 0$ and $\frac{dy}{dx} = \frac{3x^2+4x}{y}$. If the point $(1, \sqrt{10})$ is on the graph relating x and y, then what is y when $x = 0$?

a. 6 b. 3 c. 1 d. 10 e. 2

22. Determine $\int_1^2 \frac{1}{\sqrt{4-t^2}}\,dt$

a. π b. $\frac{1}{2}\pi$ c. $\frac{1}{3}\pi$ d. $\frac{1}{6}\pi$ e. $\frac{1}{4}\pi$

23. Determine $\int e^{2x}\sqrt{e^x+1}\,dx$

a. $\frac{2}{5}(e^x+1)^{5/2} - 3(e^x+1)^{3/2} + c$ b. $e^{2x}(e^x+1)^{3/2} + c$ c. $\frac{2}{5}e^{5/2\,x} - 5e^{3/2\,x} + c$

d. $\frac{2}{5}(e^x+1)^{5/2} + 3(e^x+1)^{3/2} + c$ e. $\frac{2}{5}(e^x+1)^{5/2} - \frac{2}{3}(e^x+1)^{3/2} + c$

24. A particle's acceleration for $t \geq 0$ is given by $a(t) = 12t + 4$. The particle's initial position is 2 and its velocity at $t = 1$ is 5. What is the position of the particle at $t = 2$?

a. 20 b. 10 c. 4 d. 16 e. 12

25. Determine $\int_0^{\frac{1}{2}\pi} \sin 3x \, dx + \int_0^{\frac{1}{6}\pi} \cos 3x \, dx$

a. 0 b. $\frac{-2}{3}$ c. 1 d. -1 e. $\frac{2}{3}$

26. Determine the derivative of $f(x) = \cos^3(3x + 2)$ at $x = \frac{\pi}{3}$.

a. $-9\cos^2(\pi + 2)\sin(\pi + 2)$ b. $-9\cos^2(\pi + 2)$ c. $-9\cos^2(\pi + 2)\sin(\pi + 2)$

d. $27\cos^2(\pi + 2)\sin(\pi + 2)$ e. $27\cos^2(\pi + 2)$

27. Compute the derivative of $f(x) = \int_0^{x^2} \ln(t^2 + 1) \, dt$

a. $\ln(x^2 + 1)$ b. $\frac{2x}{x^4+1}$ c. $2x \ln(x^2 + 1)$ d. $2x \ln(x^4 + 1)$ e. $\ln(x^4 + 1)$

derivative

$\frac{d}{dx} \ln t \; \frac{1}{u} \frac{du}{dx}$

28. Determine $\frac{d}{dx}\ln(\ln(2 - \cos x))$

a. $\frac{\sin x(2-\cos x)}{\ln(2-\cos x)}$ b. $\frac{\sin x}{\ln(2-\cos x)}$ c. $\frac{\cos x}{(2-\cos x)\ln(2-\cos x)}$ d. $-\frac{\cos x}{\ln(2-\cos x)}$ e. $\frac{\sin x}{(2-\cos x)\ln(2-\cos x)}$

AB practice Test - packet

#1) $f(g(-2))$

$$\frac{-2}{(-2)^2+1} = f\left(\frac{2}{5}\right) = -\frac{2}{5} - \frac{2\cdot 5}{1\cdot 5} = -\frac{2}{5} - \frac{10}{5} = \boxed{\frac{-12}{5}} \quad E$$

#2) $f(x) = x^2 - 6\sqrt{x}$

$$f'(x) = 2x - 6\cdot\frac{1}{2}x^{-1/2}$$

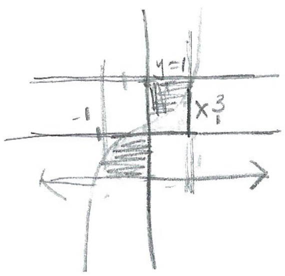
$$= 2x - \frac{3}{\sqrt{x}} \quad \text{at } x = 4$$

$$f'(4) = 2(4) - \frac{3}{\sqrt{4}} = \frac{8\cdot 2}{1\cdot 2} - \frac{3}{2} = \frac{16}{2} - \frac{3}{2} = \boxed{\frac{13}{2}} \quad D$$

#3) $x \to \infty$ bottom is bigger then $\boxed{0}$ D

#4) $f(x) = x^3$

$$\boxed{2\int_0^1 (1 - x^3)} \quad E$$



$fg' + gf'$

#5) $5x^3 - 3xy - 2y^2 = 1$

$15x^2 - 3\left[x \cdot 1 \frac{dy}{dx} + y \cdot 1\right] - 4y\frac{dy}{dx} = 0$

$15x^2 - 3x\frac{dy}{dx} - 3y - 4y\frac{dy}{dx} = 0$

$-3x\frac{dy}{dx} - 4y\frac{dy}{dx} = -15x^2 + 3y$

$\cancel{(-3x - 4y)}\frac{dy}{dx} = \frac{-15x^2 + 3y}{-3x - 4y}$

$\frac{dy}{dx} = \frac{-(15x^2 - 3y)}{-3x - 4y}$

$\boxed{\frac{dy}{dx} = -\frac{15x^2 - 3y}{-3x - 4y}}$ C

#6) $-3\sec x + 5\csc x$

$-3\sec x\tan x + 5(-\csc x\cot x)$

$\boxed{-3\sec x\tan x - 5\csc x\cot x}$ D

#7) $\int_0^{1/4} \frac{16}{1+16t^2}$

$16 \int_0^{\frac{1}{4}} \frac{1}{1+(4t)^2} dt$

$u = 4t$

$du = 4dt$

$\frac{du}{4} = \frac{4dt}{4}$

$\frac{du}{4} = dt$

$\frac{16}{4} \int_0^{1/4} \frac{1}{1+u^2} du$

$\tan^{-1} = \frac{d}{\ } \frac{1}{1+u^2}$

$4 \int_0^{\frac{1}{4}} \frac{1}{1+u^2} du$

$4 \tan^{-1} u \Big|_0^{1/4}$

$4 \tan^{-1}(4t) \Big|_0^{1/4}$

$4 \tan^{-1}(4 \cdot \frac{1}{4}) - 4 \tan^{-1}(4 \cdot 0)$

$4 \tan^{-1}(1) - 4 \tan^{-1}(0)$

$4 \cdot \frac{\pi}{4} - \cancel{4 \cdot 0}$

$\boxed{\pi}$ E

#8) $\frac{d}{dx} \frac{2x^4 - 4x}{2x^4 + 4x}$

$\frac{\cancel{2x}(x^3-2)}{\cancel{2x}(x^3+2)}$

$\frac{f'g - g'f}{g^2}$

$\frac{d}{dx} \frac{x^3-2}{x^3+2}$

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

$$\frac{\cancel{3x^5} + 6x^2 - \cancel{3x^5} + 6x^2}{(x^3+2)}$$

$$\boxed{\frac{12x^2}{(x^3+2)}}$$ B

#1) $y = 4x\sqrt{x^2+4} - 2$ at $(0,-2)$

normal line = perpendicular slope

$$y' = \cancel{4x}^{2} \cdot \frac{1}{\cancel{2}}(x^2+4)^{-1/2} \cdot 2x + \sqrt{x^2+4} \cdot 4$$

$fg' + gf'$

$$= \frac{4x^2}{\sqrt{x^2+4}} + \frac{4\sqrt{x^2+4}}{1}$$

$$= \cancel{\frac{4(0)^2}{\sqrt{(0)^2+4}}} + 4\left(\sqrt{(0)^2+4}\right)$$

$$= 4\sqrt{4} = 4 \cdot 2 = \boxed{8} \quad \boxed{m = 8}$$

perpendicular slope

$m = -\frac{1}{8}$

$$y = mx + b$$

$$-2 = -\frac{1}{8}(0) + b$$

$$\boxed{-2 = b}$$

$$8\left(y = -\frac{1}{8}x - 2\right)$$

$$8y = -x - 16$$

$$\boxed{x + 8y = -16}$$

C

#10) $f(x) = 4\sin x + 4\cos^2 x$ at $x = \pi$

$f''(x)$ tells us concavity

$f'(x) = 4\cos x + 8\cos x \cdot -\sin x$

$f'(x) = 4\cos x - 8\cos x \sin x$ $\qquad fg' + gf'$

$f''(x) = -4\sin x - 8[\cos x \cdot \cos x + \sin x \cdot -\sin x]$

$= -4\sin x - 8[\cos^2 x - \sin^2 x]$

$= -4\sin x - 8\cos^2 x + 8\sin^2 x$ $\qquad$ at $x = \pi$

$= -4\sin(\pi) - 8\cos^2(\pi) + 8\sin^2(\pi)$

$= \cancel{-4(0)} - 8(-1)^2 + \cancel{8(0)^2}$

$= -8(1) = \boxed{-8}$ A

concave down

#11) $\int 4x^2\sqrt{x^3+3}\ dx$

$4\int x^2\sqrt{x^3+3}\ dx$

$u = x^3+3$

$\frac{du}{3} = \frac{\cancel{3}x^2\,dx}{\cancel{3}}$

$\frac{du}{3} = \underline{x^2 dx}$

$\frac{4}{3}\int \sqrt{u}\ du$

$\frac{4}{3}\,\frac{u^{3/2}}{\frac{3}{2}} + c$

$\frac{4}{3}\cdot\frac{2}{3}u^{3/2} + c$

$\boxed{\frac{8}{9}(x^3+3)^{3/2} + c}$ B

#12) $f(x) = x^3 + \frac{15}{2}x^2 + 12x - 2$ local min

$f'(x) = 3x^2 + \frac{15}{\cancel{2}}\cdot\cancel{2}x + 12$

$= 3x^2 + 15x + 12 = 0$

$= 3(x^2 + 5x + 4) = 0$

$= 3(x+4)(x+1) = 0$

$\boxed{x = -4}$ $\boxed{x = -1}$

max -4 min -1

$x = -5$ $x = -3$ $x = 0$

$+$ $-$ $+$

$\boxed{\text{minimum at } x = -1}$ B

#13) $-3x^2 + cx - 3e^y = -3$ at $x=0$ slope $= 4$

$$-6x + c - 3e^y \cdot 1 \underbrace{\frac{dy}{dx}}_{\text{slope}} = 0$$

Find y

$$\frac{-3e^y}{-3e^y}\frac{dy}{dx} = \frac{6x-c}{-3e^y}$$

$$-3\cancel{(0)^2} + c\cancel{(0)} - 3e^y = -3$$

$$\frac{-3e^y}{-3} = \frac{-3}{-3}$$

$$\ln e^y = \ln 1$$

$$y = 0$$

$(0,0)$

$$\frac{dy}{dx} = \frac{6x-c}{-3e^y}$$

$$\frac{dy}{dx} = \frac{6(0) - c}{-3e^{(0)}} = 4$$

$$\frac{-c}{-3} = 4$$

$$-c = -12$$

$$\boxed{c = 12}$$ E

#14) $\int 2^x - 4e^{2\ln x}\,dx$

$\int 2^x - 4\int (e^{\ln x})^2$

$\int 2^x - 4\int x^2$

$\frac{2^x}{\ln 2} - \frac{4x^3}{3} + c$

$\boxed{\frac{2^x}{\ln 2} - \frac{4}{3}x^3 + c}$ C

#15)

$$\frac{1}{b-a}\int_a^b f(x)\,dx$$

$$\frac{1}{-1+4}$$

$$\frac{1}{3}\int_{-4}^{-1}(2x+4)^2\,dx \qquad u = 2x+4$$

$$\frac{du}{2} = \frac{2dx}{2}$$

$$\frac{1}{6}\int_{-4}^{-1}u^2\,du \qquad \frac{du}{2} = dx$$

$$\frac{1}{6}\frac{u^3}{3}\Big|_{-4}^{-1}$$

$$\frac{u^3}{18}\Big|_{-4}^{-1} = \frac{(2x+4)^3}{18}\Big|_{-4}^{-1}$$

$$\frac{(2(\overset{-2}{-1})+4)^3}{18} - \frac{(2(\overset{-8}{-4})+4)^3}{18}$$

$$\frac{8}{18} + \frac{+64}{18} = \frac{72}{18} = \boxed{4}\ \text{B}$$

#16) $\lim_{t\to 0} \frac{\tan(\frac{1}{4}\pi+t)-\tan\frac{1}{4}\pi}{t}$

$\frac{\tan\frac{\pi}{4} - \tan\frac{\pi}{4}}{0} = \frac{\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}}{0} = \frac{0}{0}$

use l'Hopitals rule

$f' = \frac{\sec^2(\frac{1}{4}\pi+t)\cdot 1 - \sec^2(\frac{1}{4}\pi)\cdot 0}{1}$

$\lim_{t\to 0}$ $\sec^2(\frac{1}{4}\pi+0)$

$\sec^2(\frac{1}{4}\pi)$

$\sec^2(\frac{\pi}{4}) = \frac{1}{x}$

$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right) = \frac{1}{\frac{\sqrt{2}}{2}} = \frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\cancel{2}\sqrt{2}}{\cancel{2}} = \sqrt{2}^{\,2}$

$= \boxed{2}$

13

#17) $f(t) = (3t^3 - 4t + 4)\sqrt{t^2 + 3t + 4}$ at $t = 0$

Slope $fg' + gf'$

$$f'(t) = (3t^3 - 4t + 4) \cdot \frac{1}{2}(t^2 + 3t + 4)^{-1/2}(2t + 3)$$

$$+ \sqrt{t^2 + 3t + 4} \cdot (9t^2 - 4)$$

at $x = 0$

$$f'(0) = \overset{2}{\cancel{4}} \cdot \frac{1}{\cancel{2}} \cdot 4^{-1/2} \cdot 3 + \sqrt{4} \cdot (-4)$$

$$= \frac{2}{\sqrt{4}} \cdot 3 \qquad + 2 \cdot -4$$

$$= \cancel{\frac{2}{2}} \cdot 3$$

$$= 3 + -8 = \boxed{-5} \ D$$

#18) $\frac{d}{dx} 7^{\cos x}$

$7^{\cos x} \cdot \ln 7 \cdot -\sin x$

$\boxed{-\sin x \cdot 7^{\cos x} \cdot \ln 7}$ A

#19)

$\pi(R^2 - r^2)$

$\int_1^2 \pi((\sqrt{x})^2 - 1^2$

$\boxed{\int_1^2 \pi(x-1)\, dx}$ B

#20) $\lim_{x \to 0} \frac{2x}{\sin 3x} + \frac{x}{\cos 3x}$

$\lim_{x \to 0} \frac{\sin x}{x} = 1$

$\lim_{x \to 0} \frac{2x}{\sin 3x} + \lim_{x \to 0} \frac{x}{\cos 3x}$

$\frac{2(0)}{\sin(0)}$ $\qquad$ $\frac{0}{\cos(0)}$

$\frac{0}{0}$ $\qquad$ $\frac{0}{1}$

Use L'Hopitals rule

$+ \quad 0$

$f' = \frac{2}{\cos 3x \cdot 3}$

$\lim_{x \to 0} = \frac{2}{3\cos 3x}$

$\frac{2}{3\cos(0)}$

$\frac{2}{3 \cdot 1}$

$\frac{2}{3} + 0 = \boxed{\frac{2}{3}}$

#21) $\frac{dy}{dx} = \frac{3x^2+4x}{y}$

$\int y\,dy = \int 3x^2+4x\,dx$

$\frac{y^2}{2} = \frac{3x^3}{3} + \frac{4x^2}{2} + c$

$\frac{y^2}{2} = x^3+2x^2+c$

$y^2 = 2x^3+4x^2+2c$ point $(1,\sqrt{10})$

$(\sqrt{10})^2 = 2(1)^3+4(1)^2+2c$

$10 = 2+4+2c$

$10 = 6+2c$
$-6\quad -6$

$4 = 2c$

$c = 2$

$y^2 = 2x^3+4x^2+4$ when $x=0$

$\sqrt{y^2} = \sqrt{4}$

$y = \pm 2$ since $y>0$

$\boxed{y=2}$ E

#22.) $\int_1^2 \frac{1}{\sqrt{4-t^2}}\,dt$

need $4-t^2 = 1-(\quad)^2$

2^2-t^2

$\sqrt{4(1-\frac{1}{4}t^2)}$

$2\sqrt{1-(\frac{1}{2}t)^2}$

$\frac{1}{\sqrt{a^2-x^2}} = \sin^{-1}\frac{x}{a}$

$= \sin^{-1}\frac{t}{2}\Big|$

$\frac{2}{2}\int_1^2 \frac{1}{\sqrt{1-(\frac{1}{2}t)^2}}\,dt$

$u=\frac{1}{2}t$

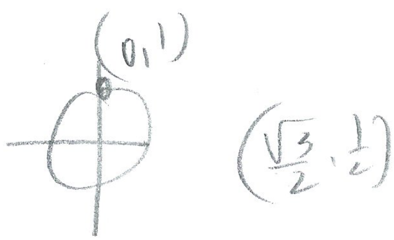
$du=\frac{1}{2}dt$

$2du=dt$

$\frac{2}{2}\int_1^2 \frac{1}{\sqrt{1-u^2}}\,du$

$1\sin^{-1}u\Big|_1^2$

$1\sin^{-1}(\frac{1}{2}t)\Big|_1^2$



$\sin^{-1}(\frac{1}{2}\cdot 2) - \sin^{-1}(\frac{1}{2})$

$\sin^{-1}(1) - \sin^{-1}(\frac{1}{2})$

$\frac{\pi}{2}\cdot\frac{3}{3}\ \frac{\pi}{6}$

$\frac{3}{6}-\frac{\pi}{6} = \frac{2\pi}{6} = \boxed{\frac{\pi}{3}}$ C

$\frac{\pi}{2} - \pi/6$

#23) $\int e^{2x}\sqrt{e^x+1}\,dx$

$u = e^x+1$

$du = e^x\,dx$

$\int e^x \cdot e^x \sqrt{e^x+1}\,dx$

since

$u = e^x+1$

$u-1 = e^x$

as well

$\int e^x \sqrt{e^x+1} \cdot e^x dx$

$\int (u-1)\sqrt{u}\,du$

$\int (u^1-1)\,u^{1/2}\,du$

$\int u^{3/2}-u^{1/2}\,du$

$\frac{u^{5/2}}{\frac{5}{2}} - \frac{u^{3/2}}{\frac{3}{2}} + C$

$\frac{2}{5}u^{5/2} - \frac{2}{3}u^{3/2} + C$

$\boxed{\frac{2}{5}(2^x+1)^{5/2} - \frac{2}{3}(2^x+1)^{3/2} + C}$

E

#24) $a(t) = \int 12t + 4$

$v(t) = \frac{12t^2}{2} + 4t + C$

$v(t) = 6t^2 + 4t + C$ $\quad$ $t = 1$ is $5 = v(t)$

$5 = 6(1)^2 + 4(1) + C$

$5 = 6 + 4 + C$

$5 = 10 + C$

$\boxed{-5 = C}$

$v(t) = \int 6t^2 + 4t - 5$

position

$s(t) = \frac{6t^3}{3} + \frac{4t^2}{2} - 5t + C$

$s(t) = 2t^3 + 2t^2 - 5t + C$ initial position

$s(t) = 2t^3 + 2t^2 - 5t + 2$ $\quad$ at $t = 2$ position = ?

$s(2) = 2(2)^3 + 2(2^2) - 5(2) + 2$

$= 16 + 8 - 10 + 2$

$= \underbrace{24 - 10}_{} + 2$

$= 14 + 2 = \boxed{16}$ D

#25) Determine

$$\int_0^{\frac{1}{2}\pi} \sin 3x\, dx + \int_0^{\frac{1}{6}\pi} \cos 3x\, dx$$

$u = 3x$

$\frac{du}{3} = \frac{\cancel{3}dy}{\cancel{3}}$

$\frac{du}{3} = dx$

$u = 3x$

$du = 3dx$

$\frac{du}{3} = dx$

$\frac{1}{3}\int_0^{\frac{\pi}{2}} \sin u\, du$

$\frac{1}{3}\int_0^{\pi/6} \cos u\, du$

$-\frac{1}{3}\cos 3x \Big|_0^{\pi/2}$

$\frac{1}{3}\sin 3x \Big|_0^{\pi/6}$

$\overset{(0,-1)}{\cancel{-\frac{1}{3}\cos\frac{3\pi}{2}}} + \overset{(1,0)}{\frac{1}{3}\cos(0)} + \overset{(0,1)}{\frac{1}{3}\sin\frac{\pi}{2}} - \overset{(1,0)}{\cancel{\frac{1}{3}\sin(0)}}$

$+\frac{1}{3}(1) \quad + \quad \frac{1}{3}(1) \quad -$

$+\frac{1}{3} \quad + \frac{1}{3}$

$\boxed{\frac{2}{3}}$ E

#20) $\frac{d}{dx} \ln(\ln(2-\cos x))$

$$\frac{1}{\ln(2-\cos x)} \cdot \frac{1}{(2-\cos x)} \cdot + +\sin x$$

$$\boxed{\frac{\sin x}{\ln(2-\cos x)(2-\cos x)}}$$

E

#26) $f(x) = \cos^3(3x+2)$ at $x = \frac{\pi}{3}$

*change exponent to a 3

$f'(x) = 3\cos^2(3x+2) \cdot -\sin(3x+2) \cdot 3$

$= -9\cos^2(3x+2)\sin(3x+2)$

$\pi/3$ $\pi/3$

$\boxed{-9\cos^2(\pi+2)\sin(\pi+2)}$ A

#27) $\cancel{\frac{d}{dx} f(x)} = \frac{d}{dx}\int_0^{x^2} \ln(t^2+1)\,dt$

derivative of x^2

$f'(x) = \ln((x^2)^2+1) \cdot 2x$

$= \ln(x^4+1) \cdot 2x$

$= \boxed{2x\ln(x^4+1)}$ D