Extra Review ⋆ Calc #6(d)

AP Review 1 NON-Calc

1. $g(x) = \int_1^x f(t)dt \rightarrow$ * $g'(x) = f(t) \rightarrow 2^{nd}$ FTC

a) $g(4) = \int_1^4 f(t)dt = \boxed{5/2}$ $g(-2) = \int_1^{-2} f(t)dt = -\int_{-2}^1 f(t)dt = \boxed{-6}$

b) $g'(1) = f(1) = \boxed{4}$

c) $g'(x) = f(x)$ is + for $(-2, 3)$ & − for $(3, 4)$, abs min must occur at an end point, $g(-2) = -6$ & $g(4) = 5/2$, so abosolute minimum is $\boxed{-6}$ @ $x = -2$.

d) $g'(x) = f(x)$ chgs from inc to dec. @ $\boxed{x = 1}$ so point of inflection occurs at $x = 1$. At $x = 2$, $g'(x) = f(x)$ does not chg from inc to dec or dec to inc. ∴ not p.o i. @ $x = 2$

A. 3. $x^3 + 3xy + 2y^3 = 17$

$3x^2 + 3y + 3x\,dy/dx + 6y^2\,dy/dx = 0$

$dy/dx(3x + 6y^2) = -3x^2 - 3y$

$dy/dx = \dfrac{-\cancel{3}(x^2+y)}{\cancel{3}(x+2y^2)} = \boxed{-\dfrac{(x^2+y)}{(x+2y^2)}}$

B 2. $\int_a^b (d - f(x))dx$

A 4. $\int \dfrac{3x^2}{\sqrt{x^3+1}}dx$ $u = x^3 + 1$ $du = 3x^2 dx$

$\int u^{-1/2} du = \boxed{2\sqrt{x^3+1} + C}$

 first $f' = 0$

D 5. $f(x) = (x-2)(x-3)^2$

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

$x^2 - 6x + 9 + 2x^2 - 10x + 12 = 0$

$3x^2 - 16x + 21 = 0 \quad (3x-7)(x-3) = 0 \quad 3 \;\&\; 7/3$

$+ \quad - \quad +$

$7/3 \quad 3$

max

6. $f(1) = 4 \quad dy/dx = \dfrac{3x^2+1}{2y}$

a) $\dfrac{3(1)^2+1}{2(4)} = \boxed{\dfrac{1}{2}}$

b) $\boxed{y - 4 = 1/2(x-1)}$

$f(1.2): \; y - 4 = \frac{1}{2}(.2) \quad y = .1 + 4 = \boxed{4.1}$

c) $\int 2y\,dy = \int (3x^2+1)\,dx$

$y^2 = x^3 + x + C \quad (1,4)$

$16 = 1 + 1 + C \quad C = 14$

$y^2 = x^3 + x + 14 \qquad \boxed{y = \sqrt{x^3+x+14}}$

★ Calc

d) $y = \sqrt{1.2^3 + 1.2 + 14} = \sqrt{1.728 + 1.2 + 14} = \sqrt{16.928} = \boxed{4.114}$

D 7. $f(x) = \sin(\frac{1}{2}x) \qquad \dfrac{\sin(3\pi/2) - \sin(\pi/2)}{\frac{3\pi}{2} - \frac{\pi}{2}} = \dfrac{-2}{\pi}$

$f'(x) = \frac{1}{2}\cos(\frac{1}{2}x)$

$1/2 \cos(x/2) = -2/\pi$

$\cos(x/2) = -4/\pi$

D 8. $f(x) = (x-1)^2 \sin x$

$f'(x) = 2(x-1)\sin x + (x-1)^2 \cos x$

$f'(0) = -2\sin 0 + \cos 0$

$f'(0) = \boxed{1}$

C 9. $a(t) = 6t - 2$ $\quad v(3) = 25$ $\quad s(1) = 10$

$v(t) = \int a(t)\,dt$ $\quad v(t) = 3t^2 - 2t + C$ $\quad (3, 25)$

$25 = 27 - 6 + C$ $\quad C = 4$

$v(t) = 3t^2 - 2t + 4$

$s(t) = \int v(t)$ $\quad x(t) = t^3 - t^2 + 4t + C$ $\quad (1, 10)$

$10 = \cancel{1 - 1} + 4 + C$ $\quad C = 6$

$\boxed{x(t) = t^3 - t^2 + 4t + 6}$

D 10. $\frac{d}{dx}\int_0^x \cos(2\pi u)\,du = \cos(2\pi x)$ * 2^{nd} FTC

C 11. $\int_2^8 f(x)\,dx = \frac{3}{2}(30+10) + \frac{2}{2}(40+30) + \frac{1}{2}(20+40)$

$= 60 + 70 + 30 = \boxed{160}$

C 12. $f(x) = x \ln x$ $\quad f'(x) = \ln x + x\left(\frac{1}{x}\right)$ $\quad \ln x + 1 = 0$

$f'(x) = \ln x + 1$ $\quad \ln x = -1$ $\quad e^{-1} = x$

* $f(1/e) = \frac{1}{e}\ln\left(\frac{1}{e}\right) = -\frac{1}{e}$ * min occurs @ $x = \frac{1}{e}$

C 13. $y = \frac{x-1}{x^3}$ $\quad y' = \frac{x^3 - 3x^2(x-1)}{x^6} = \frac{x^3 - 3x^3 + 3x^2}{x^6}$

$y' = \frac{-2x + 3}{x^4}$ $\quad y'' = \frac{-2(x^4) - 4x^3(-2x+3)}{x^8}$

$y'' = \frac{-2x^4 + 8x^4 - 12x^3}{x^8}$

POI @ $\boxed{x = 2}$

$= \frac{6x^4 - 12x^3}{x^8} = \frac{6x - 12}{x^5}$ $\quad - \mid + $ (2)