[2] $s(t) = \dfrac{81 - 27t + 2t^2}{t^{\frac{1}{3}}} = \underline{81t^{-\frac{1}{3}} - 27t^{\frac{2}{3}} + 2t^{\frac{5}{3}}}$ $1\frac{1}{2}$

$s'(t) = \underline{-27t^{-\frac{4}{3}} - 18t^{-\frac{1}{3}} + \frac{10}{3}t^{\frac{2}{3}}}$ $1\frac{1}{2}$

$s''(t) = \underline{36t^{-\frac{7}{3}} + 6t^{-\frac{4}{3}} + \frac{20}{9}t^{-\frac{1}{3}}}$ 3

$s'''(t) = \underline{-84t^{-\frac{10}{3}} - 8t^{-\frac{7}{3}} - \frac{20}{27}t^{-\frac{4}{3}}}$ 3 = JERK

ALL COEFFICIENTS MUST BE SIMPLIFIED FOR FULL CREDIT

[3][a] $$\frac{3\sec\theta\cot^2\theta - \sec^2\theta\tan\theta}{\csc^2\theta}$$

$$=\left(3\,\frac{1}{\cos\theta}\,\frac{\cos^2\theta}{\sin^2\theta} - \frac{1}{\cos^2\theta}\tan\theta\right)\sin^2\theta \quad 1\tfrac{1}{2}$$

$$= 3\cos\theta - \tan^3\theta \quad 1\tfrac{1}{2}$$

$$\frac{d}{d\theta}(3\cos\theta - \tan^3\theta) = \underbrace{-3\sin\theta}_{\frac{1}{2}} \underbrace{- 3\tan^2\theta\sec^2\theta}_{1}$$

$$\frac{d^2}{d\theta^2}(3\cos\theta - \tan^2\theta)$$

$$= -3\cos\theta - 3\big((2\tan\theta\sec^2\theta)\sec^2\theta \quad 2$$

$$+ \tan^2\theta(2\sec\theta\sec\theta\tan\theta)\big) \quad 2$$

$$= \underbrace{-3\cos\theta}_{\frac{1}{2}} \underbrace{- 6\tan\theta\sec^4\theta - 6\tan^3\theta\sec^2\theta}_{1}$$

IN PREPARATION FOR MATH 1B,
THE ANSWER CAN BE REWRITTEN AS

$$-3\cos\theta - 6\tan\theta(\tan^2\theta+1)^2 - 6\tan^3\theta(\tan^2\theta+1)$$

$$= -3\cos\theta - 6\tan\theta(\tan^4\theta + 2\tan^2\theta + 1)$$

$$-6\tan^5\theta - 6\tan^3\theta$$

$$= -3\cos\theta - 12\tan^5\theta - 18\tan^3\theta - 6\tan\theta$$

[b] $$\frac{(1-4y)(2-y^3)-(3+y-2y^2)(-3y^2)}{(2-y^3)^2} \quad 3 \quad 1$$

$$= \frac{2-8y-y^3+4y^4+9y^2+3y^3-6y^4}{(2-y^3)^2} \quad 1\tfrac{1}{2}$$

$$= \boxed{\frac{2-8y+9y^2+2y^3-2y^4}{(2-y^3)^2}} \quad 1$$

[4][a] $g'(z) = \underset{1}{\underline{(\sec^2 z)\sin(3\cot z)}} + \underset{2}{\underline{(\tan z)\cos(3\cot z)(-3\csc^2 z)}}$

$= \sec^2 z \sin(3\cot z) - 3\left(\frac{\sin z}{\cos z}\right)\left(\frac{1}{\sin^2 z}\right)\cos(3\cot z)$

$= \underset{1\frac{1}{2}}{\underline{\sec^2 z \sin(3\cot z) - 3\sec z \csc z \cos(3\cot z)}}$

[b] LET $x = 3\cot z$ ① $\longrightarrow \frac{x}{3} = \cot z \longrightarrow \frac{3}{x} = \tan z$

$$\lim_{z \to \frac{3\pi}{2}} x = \lim_{z \to \frac{3\pi}{2}} \cot z = \cot \frac{3\pi}{2} = 0$$

$$\lim_{z \to \frac{3\pi}{2}} (\tan z) \sin(3\cot z) = \boxed{\lim_{x \to 0}} \boxed{\frac{3}{x} \sin x} = 3 \lim_{x \to 0} \frac{\sin x}{x}$$

① ①

$$= 3 \cdot 1 = 3$$ ①

[5] $x=3 \rightarrow y = e^{-6}p(9) = \underline{-4e^{-6}}$ $\frac{1}{2}$

$$\frac{dy}{dx} = \underbrace{e^{-2x}(-2)p(x^2)}_{1} + \underbrace{e^{-2x}p'(x^2)(2x)}_{1}$$

$$= 2e^{-2x}(-p(x^2) + xp'(x^2))$$

$$\left.\frac{dy}{dx}\right|_{x=3} = \underline{2e^{-6}(-p(9)+3p'(9)) = 2e^{-6}(-(-4)+3(-1))} = \underline{2e^{-6}}$$

1 EITHER IS OK $\frac{1}{2}$

$$m = \frac{-1}{2e^{-6}} = -\frac{1}{2}e^{6}$$

$$\underline{y + 4e^{-6} = -\frac{1}{2}e^{6}(x-3)}$$

1 1