Chapter 5 Review Answer Key (Non-calculator)

B

1. $f(x) = \frac{\ln x}{x}$

$$f'(x) = \frac{x\left(\frac{1}{x}\right) - \ln x}{x^2} = \frac{1-\ln x}{x^2}$$

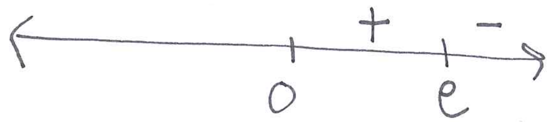
$1 - \ln x = 0$

$-\ln x = -1$

$\ln x = 1$

$x = e$

$\frac{1-\ln(-1)}{1} = DNE$



$\frac{1-\ln e}{e^2} = \frac{0}{e^2} = 0$

$x = e$

$y = \frac{\ln e}{e} = \frac{1}{e} = \boxed{B}$

$\frac{1-\ln 1}{e^2} = \frac{1}{e^2} = +$

$\frac{1-\ln 3}{e^2} = -$

2. $g(x) = x^2 e^{kx}$

$g'(x) = x^2 k e^{kx} + e^{kx}(2x)$

$= xe^{kx}(xk + 2)$

$xe^{kx} = 0$

$e^{\frac{2}{3}x} = 0$

$\cancel{\frac{2}{3}x = \ln 0}$

$xk + 2 = 0$

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

$\frac{2}{3}k = -2$

$k = -\cancel{2} \cdot \frac{3}{\cancel{2}} = -3 = \boxed{A}$

3. $\int_0^2 e^{\frac{1}{2}x}\,dx = \int_0^2 e^u\, 2du = 2\int_{\cancel{0}\,0}^{\cancel{2}\,1} e^u\,du$

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

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

$2du = dx$

$u = \frac{1}{2}(2) = 1$

$u = \frac{1}{2}(0) = 0$

$2\left[e^u\right]_0^1 =$

$2\left[e^1 - e^0\right] = 2\left[e - 1\right] = 2e - 2$

$= \boxed{A}$

4. $f(x) = (2x+1)^3$

$g(1) = 0$

$\cancel{\dfrac{1}{f'(f^{-1}(0))} = \dfrac{1}{f'(}}$

$y = (2x+1)^3$

$x = (2y+1)^3$

$\dfrac{\sqrt[3]{x} - 1}{2} = \frac{1}{2}x^{1/3} - \frac{1}{2} = g(x)$

$g'(x) = \frac{1}{6}x^{-2/3}$

$g'(1) = \frac{1}{6}(1)^{-2/3} = \frac{1}{6} = \boxed{D}$

Chapter 5 Review Answer Key - Calculator

1. Crosses x-axis @ .606
   $f'(.606) = 2.961 = \boxed{D}$

2. $\boxed{D}$ → looking to see where f' is decreasing

3. $\left[\int_0^2 r(t)\right] + 800 = \boxed{D}$

FRQ

a. $P'(9) = -0.646 < 0$ → The amount of pollutant is <u>not</u> increasing, it is decreasing.

b. $P'(t) = 0$ (graph)
   $t = 30.174$

   $\xleftarrow{\quad - \quad} \; 30.174 \; \xrightarrow{\quad + \quad}$

   minimum @ $t = 30.174$ b/c $f'(x)$ changes from $-$ to $+$.

c. $50 + \int_0^{30.174} 1 - 3e^{-0.2\sqrt{t}} = 35.104 < 40$, so it's safe!

d. $P'(0) = -2$, at $t=0$, the amount of pollutants needs to decrease by 10 (from 50 to 40). If slope is -2, this will happen at $t=5$.