

Math 122 HW #9

Section 8.4 # 8, 15, 20, 42, 51

8.4 #8

$$\int_1^{\infty} \frac{1}{x^{.999}} dx = \lim_{b \rightarrow \infty} \int_1^b x^{-.999} dx$$

$$= \lim_{b \rightarrow \infty} \left. \frac{x^{.001}}{.001} \right|_1^b = \lim_{b \rightarrow \infty} \frac{b^{.001}}{.001} - \frac{1^{.001}}{.001}$$

DNE

8.4 #15

$$\int_{-\infty}^0 1000e^x dx = \lim_{b \rightarrow -\infty} \int_b^0 1000e^x dx = \lim_{b \rightarrow -\infty} 1000e^x \Big|_b^0$$

$$= \lim_{b \rightarrow -\infty} 1000e^0 - 1000e^b = 1000e^0 = \underline{1000}$$

8.4 #20

$$\int_0^{\infty} \frac{dx}{(4x+1)^3}$$

$$u = 4x+1$$

$$du = 4 dx$$

$$\frac{1}{4} du = dx$$

$$= \lim_{b \rightarrow \infty} \int_{x=0}^{x=b} \frac{1}{u^3} \cdot \frac{1}{4} du = \lim_{b \rightarrow \infty} \frac{1}{4} \int u^{-3} du$$

$$= \lim_{b \rightarrow \infty} \left. \frac{1}{4} \cdot \frac{1}{-2} u^{-2} \right|_{x=0}^{x=b} = \lim_{b \rightarrow \infty} \left. -\frac{1}{8} (4x+1)^{-2} \right|_0^b$$

$$= \lim_{b \rightarrow \infty} \frac{-1}{8} (4b+1)^{-2} - \frac{-1}{8} (1)^{-2} = \underline{\underline{\frac{1}{8}}}$$

8.4 #42

$$P = \int_0^t f(x) e^{-rx} dx$$

$$= \int_0^{\infty} 225000 e^{-.06x} dx$$

$$= \lim_{b \rightarrow \infty} 225000 \int_0^b e^{-.06x} dx = \lim_{b \rightarrow \infty} \left. \frac{225000}{-.06} e^{-.06x} \right|_0^b$$

$$= \lim_{b \rightarrow \infty} \frac{225000}{-.06} e^{-.06b} - \frac{225000}{-.06} e^0 = \frac{225000}{.06} = 3750000$$

8.4 #51

$$\int_0^{\infty} 50 e^{-.06t} dt = \lim_{b \rightarrow \infty} \int_0^b 50 e^{-.06t} dt$$

$$= \lim_{b \rightarrow \infty} \left. \frac{50}{-.06} e^{-.06t} \right|_0^b = \lim_{b \rightarrow \infty} \frac{50}{-.06} e^{-.06b} - \frac{50}{-.06} e^{-.06 \cdot 0}$$

$$= 0 - \frac{50}{-.06} = \frac{50}{.06} \approx 833.33$$