Math 1172 Homework #7

Section 7.4 #9, 18

7.8 #11, 39

7.4 #9

$$\int \frac{5x+1}{(2x+1)(x-1)}\,dx \qquad \frac{A}{2x+1} + \frac{B}{x-1}$$

$$A(x-1) + B(2x+1) = 5x+1$$

$$(A+2B)x + -A+B = 5x+1$$

$$A+2B = 5$$

$$-A+B = 1$$

$$3B = 6 \quad B = 2 \quad A = 1$$

$$= \int \frac{1}{2x+1} + \frac{2}{x-1}\,dx = \frac{1}{2}\ln|2x+1| + 2\ln|x-1| + C$$

7.4 #18

$$\int_1^2 \frac{3x^2+6x+2}{x^2+3x+2}\,dx$$

$$x^2+3x+2 \;\overline{)\; 3x^2+6x+2}$$

$$3$$

$$3x^2+9x+6$$

$$-3x-4$$

$$\int_1^2 \frac{3x^2+6x+2}{x^2+3x+2}\,dx = \int_1^2 3 + \frac{-3x-4}{(x+2)(x+1)}\,dx$$

$$\frac{A}{x+2} + \frac{B}{x+1}$$

$$A(x+1) + B(x+2) = -3x-4$$

$$A+B = -3 \qquad B = -1$$

$$A+2B = -4 \qquad A = -2$$

$$-B = 1$$

$$\int_1^2 3 + \frac{-2}{x+2} + \frac{-1}{x+1}\,dx$$

$$= 3x - 2\ln|x+2| - \ln|x+1| \Big|_1^2$$

$$= 3\cdot 2 - 2\ln 4 - \ln 3 - \left(3\cdot 1 - 2\ln 3 - \ln 2\right)$$

7.8 #11

$$\int_3^\infty \frac{1}{(x-2)^{3/2}}\,dx = \lim_{t\to\infty} \int_3^t (x-2)^{-3/2}\,dx$$

$$= \lim_{t\to 3} -2(x-2)^{-1/2} \Big|_3^t$$

$$= \lim_{t\to 3} -2(t-2)^{-1/2} - \left(-2(3-2)^{-1/2}\right)$$

$$= 0 + 2\cdot 1^{-1/2} = 2$$

7.8 #39

$$\int_{-2}^3 \frac{1}{x^4}\,dx = \int_{-2}^0 x^{-4}\,dx + \int_0^3 x^{-4}\,dx$$

$$\int_{-2}^0 x^{-4}\,dx = \lim_{t\to 0} -\frac{1}{3}x^{-3} \Big|_{-2}^t = \lim_{t\to 0} -\frac{1}{3}t^{-3} - -\frac{1}{3}(-2)^{-3}$$

$-\frac{1}{3}\cdot\frac{1}{0^3}$ DNE

the integral diverges