1 (a) Evaluate the indefinite integral $\int \frac{11\sqrt[4]{x} - 15x}{\sqrt[3]{x}}\,dx$. 2%

$$\underbrace{-9x^{5/3}}_{1\%} + \underbrace{12x^{\frac{11}{12}}}_{1\%} + C$$

(b) Calculate the area between $y = 5^x + \sin(x^7) + x^{11}$ and the x-axis for $-2 \le x \le 2$. 2%

$$A = \int_{-2}^{2}\left(5^x + \sin x^7 + x^{11}\right) \text{———} \tfrac{1}{2}\%$$

$$= \underbrace{\frac{1}{\ln 5}\left(25 - \frac{1}{25}\right)}_{\frac{1}{2}\%} + \underbrace{0}_{\frac{1}{2}\%} + \underbrace{0}_{\frac{1}{2}\%}$$

(c) Express as a definite integral and then *evaluate* the limit of the Riemann sum $\lim_{n\to\infty}\sum_{i=1}^{n}\frac{1}{\sqrt{c_i+1}}\Delta x$, where $c_i \in [x_{i-1}, x_i]$, and we use the partition P with $x_i = -1 + \frac{4i}{n}$ for $i = 0, 1, \ldots, n$ and $\Delta x \equiv x_i - x_{i-1}$. 1%

$$= \int_{-1}^{3}\frac{dx}{\sqrt{x+1}} \Big\}\ \tfrac{1}{2}\%$$

$$= 2\sqrt{x+1}\,\Big|_{-1}^{3} = \boxed{4} \Big\}\ \tfrac{1}{2}\%$$

(d) Evaluate $\frac{d}{dx}\int_{x^3-x}^{\pi}(\sin t + 1)\,dt$. 1%

$$\underbrace{0}_{\frac{1}{2}\%} - \underbrace{(3x^2-1)\cdot\left[\sin(x^3-x)+1\right]}_{\frac{1}{2}\%}$$

(e) Find an upper bound for the error E_S in the Simpson's Rule approximation of the definite integral $\int_0^1 e^{-\sqrt{3}x}\,dx$, using N subintervals. Choose N such that $E_S \le 5\cdot 10^{-6}$. Hint: evaluate $M_4 = \max_{x\in[0,1]}\left|\frac{d^4}{dx^4}e^{-\sqrt{3}x}\right|$. 2%

$$M_4 = \left(\sqrt{3}\right)^4 = 9 \Big\}\ \tfrac{1}{2}\%$$

$$E_S \le \frac{(b-a)^5\cdot M_4}{180\cdot N^4} = \frac{1\cdot 9}{180\cdot N^4} = \frac{1}{20N^4} \Big\}\ \tfrac{1}{2}\%$$

$$\underbrace{\frac{1}{20\cdot N^4} \le 5\cdot 10^{-6}}_{\frac{1}{2}\%} \Longrightarrow \boxed{N \ge 10} \Big\}\ \tfrac{1}{2}\%$$

2 Evaluate the indefinite integral $\int \cos^3 x \cdot \sin^2 x\,dx$. 3%

$$= \int\left(1-\sin^2 x\right)\cdot\sin^2 x\cdot\underbrace{\cos x\cdot dx}_{d(\sin x)} \Big\}\ 1\%$$

$$u = \sin x$$

$$1\%\quad = \int\left(1-u^2\right)u^2\,du = \frac{u^3}{3} - \frac{u^5}{5} \Big\}\ \tfrac{1}{2}\%$$

$$= \boxed{\frac{\sin^3 x}{3} - \frac{\sin^5 x}{5} + C} \Big\}\ \tfrac{1}{2}\%$$