assignment #1

P313 # 48, 52, 58 P382-384 # 14, 46, 68, 74 P451 # 30, 46

P313 48. $y = 4e^{\sqrt{x}}$.

$y' = 4e^{\sqrt{x}}\left(\frac{1}{2\sqrt{x}}\right) = \frac{2e^{\sqrt{x}}}{\sqrt{x}}$

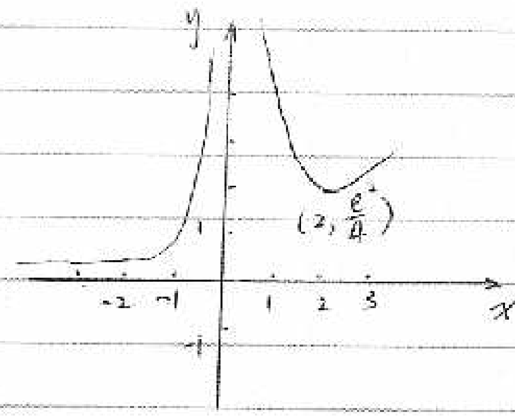
52. $y = (2e^{3x})^{\frac{1}{3}}$

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

58. $f(x) = \frac{e^x}{x^2}$

$f'(x) = \frac{x^2e^x - 2xe^x}{x^4} = \frac{e^x(x-2)}{x^3}$

$f''(x) = \frac{e^x(x^2-4x+6)}{x^4}$



Relative minimum. $(2, \frac{e^2}{4})$

Horizontal asymptote: $y=0$

No points of inflection.

P382-384 14. $f'(x) = \int(6x^{-\frac{1}{2}}+3)\,dx = 12x^{\frac{1}{2}}+3x+C_1$

$f'(1) = 12 = 12+3+C_1 \implies C_1 = -3$

$f'(x) = 12x^{\frac{1}{2}}+3x-3$

$f(x) = \int(12x^{\frac{1}{2}}+3x-3)\,dx = 8x^{\frac{3}{2}}+\frac{3}{2}x^2-3x+C_2$

$f(4) = 56 = 64+24-12+C_2 \implies C_2 = -20$

$f(x) = 8x^{\frac{3}{2}}+\frac{3}{2}x^2-3x-20$

46. $\int_3^6 \frac{x}{3\sqrt{x^2-8}}\,dx = \frac{1}{3}\left(\frac{1}{2}\right)\int_3^6 (x^2-8)^{-\frac{1}{2}}(2x)\,dx$

$= \frac{1}{6}(2)(x^2-8)^{\frac{1}{2}}\Big|_3^6 = \frac{1}{3}\sqrt{x^2-8}\Big|_3^6 = \frac{1}{3}(2\sqrt{7}-1)$

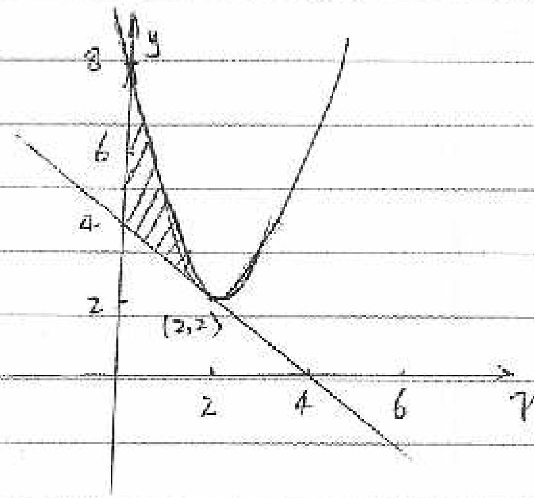
68. $\int_{-1}^{0}(x^3-x)\,dx = -\int_0^1(x^3-x)\,dx = \frac{1}{4}$ (odd function).

74. $4 - x = x^2 - 5x + 8$

$x^2 - 4x + 4 = 0$

$(x-2)^2 = 0$

$x = 2$



$A = \int_0^2 [(x^2-5x+8)-(4-x)]\,dx$

$= \int_0^2 (x^2-4x+4)\,dx$

$= \frac{x^3}{3} - 2x^2 + 4x \Big|_0^2$

$= \frac{8}{3}$

P451 30. Use integration by parts and let $u = \ln x$ and $dv = \sqrt{x}\,dx$

then $du = (\frac{1}{x})dx$ and $v = (\frac{2}{3})x^{\frac{3}{2}}$

$\int \sqrt{x}\ln x\,dx = \frac{2}{3}x^{\frac{3}{2}}\ln x - \int \frac{2}{3}x^{\frac{3}{2}}(\frac{1}{x})\,dx$

$= \frac{2}{3}x^{\frac{3}{2}}\ln x - \frac{2}{3}\int x^{\frac{1}{2}}\,dx$

$= \frac{2}{3}x^{\frac{3}{2}}\ln x - \frac{4}{9}x^{\frac{3}{2}} + C$

$= \frac{2}{9}x^{\frac{3}{2}}[(3\ln x) - 2] + C.$

46. Use partial fractions

$\frac{4x^2-x-5}{x^2(x+5)} = \frac{A}{x} + \frac{B}{x^2} + \frac{C}{x+5}$

Basic equation: $4x^2 - x - 5) = Ax(x+5) + B(x+5) + Cx^2$

when $x=0$: $-5 = 5B$, $B = -1$

when $x=-5$: $100 = 25C$, $C = 4$

when $x=1$: $-2 = 6A + 6B + C$, $A = 0$

$\int \frac{4x^2-x-5}{x^2(x+5)}\,dx = \int(-\frac{1}{x^2} + \frac{4}{x+5})\,dx = \frac{1}{x} + 4\ln|x+5| + C.$