

$$30. \int x^2 \cos x \, dx$$

$$\int u \, dv = uv - \int v \, du$$

$$u = x^2 \quad dv = \cos x \, dx$$

$$du = 2x \, dx \quad v = \sin x$$

$$= x^2 \sin x - \int 2x \sin x \, dx$$

$$u = 2x \quad dv = \sin x \, dx$$

$$du = 2 \, dx \quad v = -\cos x$$

$$= x^2 \sin x - (-2x \cos x + \int 2 \cos x \, dx)$$

$$= x^2 \sin x + 2x \cos x - \int 2 \cos x \, dx$$

$$= x^2 \sin x + 2x \cos x - 2 \sin x + C$$

$$36. \int e^x \cos 2x \, dx = e^x \cos 2x + \int 2e^x \sin 2x \, dx$$

$$u = \cos 2x \quad dv = e^x \, dx$$

$$du = -2 \sin 2x \, dx \quad v = e^x$$

$$u = 2 \sin 2x \quad dv = e^x \, dx$$

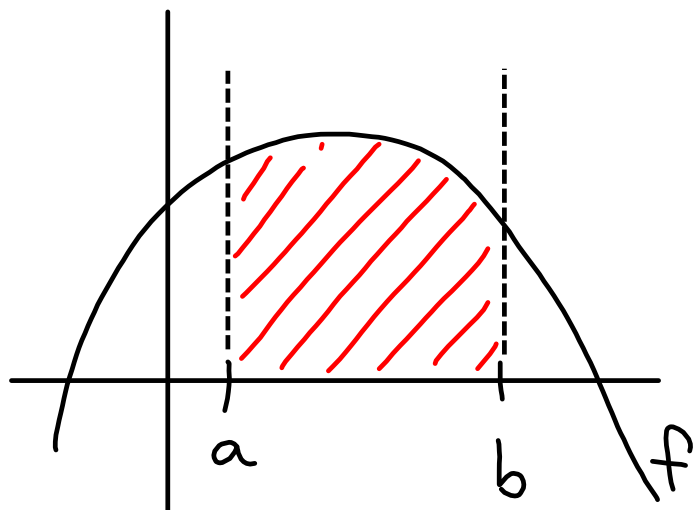
$$du = 4 \cos 2x \, dx \quad v = e^x$$

$$\int e^x \cos 2x \, dx = e^x \cos 2x + 2e^x \sin 2x - 4 \int e^x \cos 2x \, dx$$

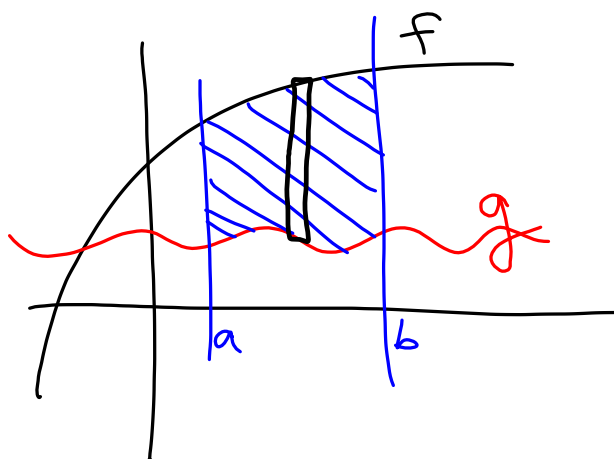
$$5 \int e^x \cos 2x \, dx = e^x \cos 2x + 2e^x \sin 2x$$

$$\int e^x \cos 2x \, dx = \frac{1}{5} e^x \cos 2x + \frac{2}{5} e^x \sin 2x + C$$

7.1 - Area Between Curves

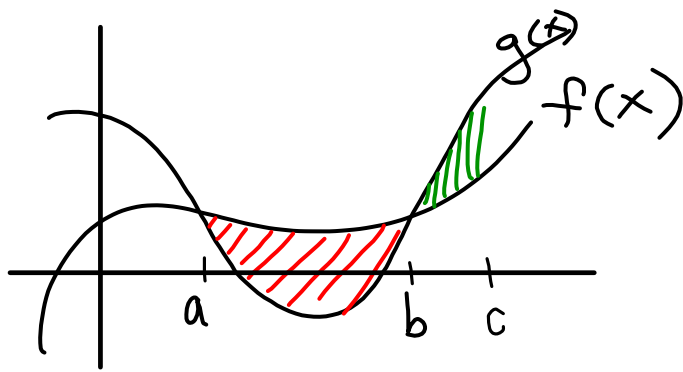


Area of region
bounded by $f(x)$
& x-axis, between
 a and b is
$$\int_a^b f(x) dx$$



area =

$$\int_a^b (f(x) - g(x)) dx$$
$$= \int_a^b f(x) dx - \int_a^b g(x) dx$$



area of red region:

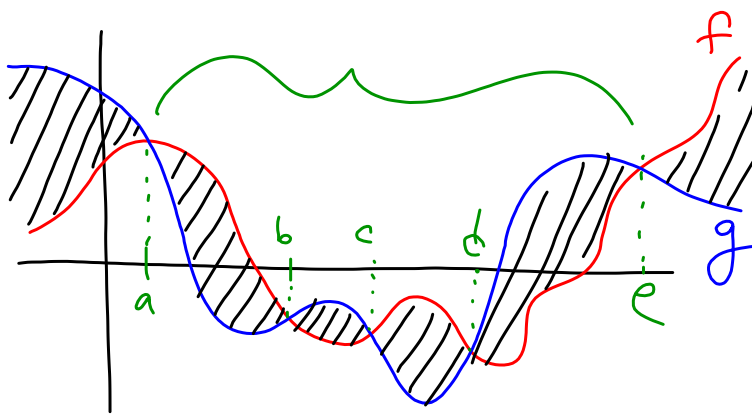
$$\int_a^b (f(x) - g(x)) dx$$

area of green region

$$\int_b^c (g(x) - f(x)) dx$$

area of whole:

$$\int_a^b (f(x) - g(x)) dx + \int_b^c (g(x) - f(x)) dx$$

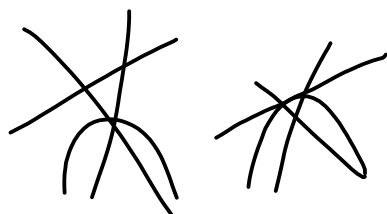
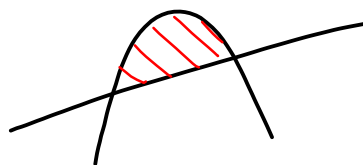


area of shaded region:

$$\int_a^b (f(x) - g(x)) dx + \int_b^c (g(x) - f(x)) dx + \int_c^d (f(x) - g(x)) dx + \int_d^e (g(x) - f(x)) dx$$

7.1 Find the area between the curves.

18. $f(x) = -x^2 + 4x + 1$
 $g(x) = x + 1$



$$-x^2 + 4x + 1 = x + 1$$

$$0 = x^2 - 3x = x(x-3)$$

$$x = 0, x = 3$$

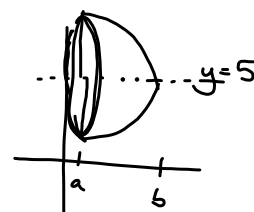
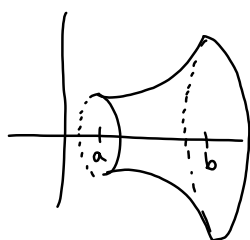
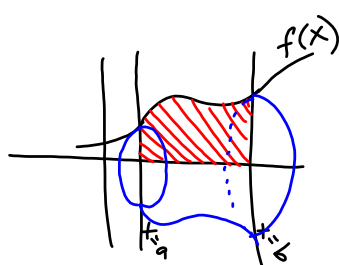
$$\int_0^3 [-x^2 + 4x + 1 - (x + 1)] dx \rightarrow \int_0^3 (-x^2 + 3x) dx$$

$$\left. \frac{-x^3}{3} + \frac{3}{2}x^2 \right|_0^3$$

$$\frac{-(3)^3}{3} + \frac{3}{2}(3)^2 - 0$$

$$-9 + \frac{27}{2} = \boxed{\frac{9}{2}}$$

7.2 Volume of Solids of Revolution



Integration by Parts

8.2, p521 # 7-29 odd

Area

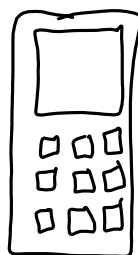
7.1, p442 # 1-11 odd, 17-29 odd

find area of region bounded by:

$$\frac{7.1}{\#18} \quad y = -x^3 + 2, \quad y = x - 3, \quad x = -1, \quad x = 1$$

$$-x^3 + 2 = x - 3$$

$$0 = x^3 + x - 5$$



$$\text{solve } (0 = x^3 + x - 5, x)$$

$$x = 1.51598$$