

1. We set the two functions equal to determine the intersection points.

$$x^4 - 7x^2 + 5 = 86 - 7x^2$$

$$x^4 - 81 = 0$$

$$(x^2 + 9)(x^2 - 9) = 0$$

$$(x^2 + 9)(x + 3)(x - 3) = 0$$

The graphs intersect when  $x = -3$  and  $x = 3$ . Thus we have that

$$\text{area} = \int_{-3}^3 \left( (86 - 7x^2) - (x^4 - 7x^2 + 5) \right) dx = \boxed{388.8}$$

2. From  $x = -4$  to  $x = 6$ , shade in the area between the  $x$ -axis and the graph of  $f(x)$ . The area from  $x = -4$  to  $x = 3$  should be above the  $x$ -axis and approximately equal to 27. The area from  $x = 3$  to  $x = 6$  should be below the  $x$ -axis and approximately equal to 7.5.

$$\int_{-4}^6 f(x) dx \approx 27 - 7.5 = \boxed{19.5}$$

3. Solving  $0 = 30 - e^x$  for  $x$  gives  $x = \ln 30$  as the  $x$ -intercept.

$$\text{area} = \int_0^{\ln 30} (30 - e^x) dx$$