

Name: Solutions

Directions: Show all work. No credit for answers without work.

1. [2 parts, 2 points each] Simplify the following expressions if possible.

(a) $(x^2 \cdot x^5)^3$

$$= (x^{2+5})^3 = (x^7)^3 = x^{7 \cdot 3}$$

$$= \boxed{x^{21}}$$

(b) $\sqrt{x^2 + y^2}$

No simplification possible

Note: $\sqrt{x^2 + y^2} \neq \sqrt{x^2} + \sqrt{y^2}$

$$\sqrt{4 + 25} \neq \sqrt{4} + \sqrt{25}$$

2. [2 points] For which real numbers
- b
- does
- $x^2 + bx + 5 = 0$
- have a single solution?

Note that $x^2 + bx + 5 = 0$ has
the solus

$$x = \frac{-b \pm \sqrt{b^2 - 4 \cdot 5}}{2}$$

$$= \frac{-b}{2} \pm \frac{1}{2} \sqrt{b^2 - 20}$$

The equation has 1 solution if
and only if $\frac{1}{2} \sqrt{b^2 - 20} = 0$:

$$\sqrt{b^2 - 20} = 0$$

$$b^2 = 20$$

$$b = \pm \sqrt{20} = \boxed{\pm 2\sqrt{5}}$$

3. [2 parts, 2 points each] Solve the following indefinite integrals.

(a) $\int (x+1)(x+2) dx$

$$= \int x^2 + 3x + 2 dx$$

$$= \boxed{\frac{x^3}{3} + \frac{3}{2}x^2 + 2x + C}$$

(b) $\int x e^{x^2} dx$

$u = x^2$

$du = 2x dx$

$$= \int \frac{1}{2} \cdot e^{x^2} \cdot 2x dx$$

$$= \int \frac{1}{2} e^u du = \frac{1}{2} e^u + C$$

$$= \boxed{\frac{1}{2} e^{x^2} + C}$$