Twelfth Set of Homework

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Due: Tuesday March 8

Please note: You should fully justify your answers.

Complex numbers

1. Perform the following operations. Give your answers in the form $a + bi$ where a and b are real numbers.
   (a) $\sqrt{-16}$
   (b) $\sqrt{-12} + \sqrt{-20}$
   (c) $\sqrt{-3}(1 - \sqrt{-75})$
   (d) i^{29}
   (e) $-i^{10}$
   (f) $2i(7 - 4i)$
   (g) $\left(\frac{2}{3} + 3i\right) + \left(6 - \frac{3i}{5}\right)$
   (h) $(-3 + 5i) - (5 - 3i)$
   (i) $(4 + 3i)(4 - 3i)$
   (j) $\left(\frac{1}{3} - \frac{3i}{2}\right)\left(\frac{1}{3} + \frac{3i}{2}\right)$
   (k) $(2 - 3i)(-5 + 4i)$
   (l) $(6 - 5i)^2$
   (m) $(3 + 5i)^2$
   (n) $\left(\frac{1}{\sqrt{2}} + \frac{i}{\sqrt{2}}\right)^2$
   (o) $(2 - i)^3$
   (p) $\frac{7}{2 - 3i}$
   (q) $\frac{2 - i}{-i}$
   (r) $\frac{(3 - 4i)(-1 + 2i)}{2 - i}$
   (s) $\frac{-1 - i}{2 - 3i}$
2. Evaluate each of the following expressions when $z = -2 + 3i$:
   (a) $z^2 + 4z$
   (b) $3z^3 - 138$
   (c) $z^3 - z^2 - 7z - 65$
   (d) $\frac{3 + 2i}{iz}$
   (e) $-\frac{3z^2}{12i + 5}$