CLAIMS:

1. A chimeric, CDR-grafted, humanized or recombinant human antibody, or antigen-binding fragment thereof, that specifically binds to human PTK7 and which comprises light and heavy chain variable regions, wherein:

   (a) the light chain variable region comprises three CDRs set forth as residues 24-34 of SEQ ID NO: 62 for V_L CDR1, residues 50-56 of SEQ ID NO: 62 for V_L CDR2, and residues 89-97 of SEQ ID NO: 62 for V_L CDR3, and the heavy chain variable region comprises three CDRs set forth as residues 31-35 of SEQ ID NO: 63 for V_H CDR1, residues 50-65 of SEQ ID NO: 63 for V_H CDR2, and residues 95-102 of SEQ ID NO: 63 for V_H CDR3, wherein the CDR numbering is according to Kabat;
   (b) the light chain variable region comprises three CDRs set forth as residues 23-34 of SEQ ID NO: 62 for V_L CDR1, residues 50-56 of SEQ ID NO: 62 for V_L CDR2, and residues 89-97 of SEQ ID NO: 62 for V_L CDR3, and the heavy chain variable region comprises three CDRs set forth as residues 26-32 of SEQ ID NO: 63 for V_H CDR1, residues 50-58 of SEQ ID NO: 63 for V_H CDR2, and residues 95-102 of SEQ ID NO: 63 for V_H CDR3, wherein the CDR numbering is according to Chothia; or
   (c) the light chain variable region comprises three CDRs set forth as residues 30-36 of SEQ ID NO: 62 for V_L CDR1, residues 46-55 of SEQ ID NO: 62 for V_L CDR2, and residues 89-96 of SEQ ID NO: 62 for V_L CDR3, and the heavy chain variable region comprises three CDRs set forth as residues 30-35 of SEQ ID NO: 63 for V_H CDR1, residues 47-58 of SEQ ID NO: 63 for V_H CDR2, and residues 93-101 of SEQ ID NO: 63 for V_H CDR3,

   wherein the CDR numbering is according to MacCallum.

2. A chimeric, CDR-grafted, humanized or recombinant human antibody, or antigen-binding fragment thereof, that specifically binds to human PTK7 and which comprises light and heavy chain variable regions, wherein:

   (a) the light chain variable region comprises three CDRs set forth as residues 24-34 of SEQ ID NO: 64 for V_L CDR1, residues 50-56 of SEQ ID NO: 64 for V_L CDR2, and residues 89-97 of SEQ ID NO: 64 for V_L CDR3, and the heavy chain variable region comprises three CDRs set forth as residues 31-35 of SEQ ID NO: 65 for V_H CDR1, residues 50-65 of SEQ ID NO: 65 for V_H CDR2, and residues 95-102 of SEQ ID NO: 65 for V_H CDR3, wherein the CDR numbering is according to Kabat;
   (b) the light chain variable region comprises three CDRs set forth as residues 23-34 of SEQ ID NO: 64 for V_L CDR1, residues 50-56 of SEQ ID NO: 64 for V_L CDR2, and residues 89-97 of SEQ ID NO: 64 for V_L CDR3, and the heavy chain variable region comprises three CDRs set forth as residues 26-32 of SEQ ID NO: 65 for V_H CDR1, residues 50-58 of SEQ ID NO: 65 for V_H CDR2, and residues 95-102 of SEQ ID NO: 65 for V_H CDR3; wherein the CDR numbering is according to Chothia; or
   (c) the light chain variable region comprises three CDRs set forth as residues 30-36 of SEQ ID NO: 64 for V_L CDR1, residues 46-55 of SEQ ID NO: 64 for V_L CDR2, and residues 89-96 of SEQ ID NO: 64 for V_L CDR3; and the heavy chain variable region comprises three CDRs set forth as residues 30-35 of SEQ ID NO: 65 for V_H CDR1, residues 47-58 of SEQ ID NO: 65 for V_H CDR2, and residues 93-101 of SEQ ID NO: 65 for V_H CDR3; wherein the CDR numbering is according to MacCallum.

3. The antibody or antigen-binding fragment thereof of claim 1 or 2, comprising:

   (a) a light chain variable region having an amino acid sequence that is at least 60% identical to SEQ ID NO: 62 and a heavy chain variable region having an amino acid sequence that is at least 60% identical to SEQ ID NO: 63; or
   (b) a light chain variable region having an amino acid sequence that is at least 60% identical to SEQ ID NO: 64 and a heavy chain variable region having an amino acid sequence that is at least 60% identical to SEQ ID NO: 65.

4. The antibody or antigen-binding fragment thereof of claim 1, comprising a light chain variable region set forth as SEQ ID NO: 62, and a heavy chain variable region set forth as SEQ ID NO: 63.

5. The antibody or antigen-binding fragment thereof of claim 2, comprising a light chain variable region set forth as SEQ ID NO: 64, and a heavy chain variable region set forth as SEQ ID NO: 65.

6. The antibody or antigen-binding fragment thereof of any one of claims 1-5, which is a neutralizing, depleting antibody, and/or internalizing antibody.

7. The antibody or antigen-binding fragment thereof of any one of claims 1-6, which specifically binds to a PTK7 isoform selected from the group consisting of isoform a, isoform b, isoform c, and isoform d.

8. An antibody conjugate comprising the antibody or antigen-binding fragment thereof of any one of claims 1-7, which antibody is conjugated, linked, or otherwise associated with a cytotoxic agent.

9. A pharmaceutical composition comprising the antibody or antigen-binding fragment thereof of any one of claims 1-7, or the antibody conjugate of claim 8.

10. A nucleic acid encoding the heavy chain variable region and/or the light chain variable region of the antibody or antigen-binding fragment thereof of any one of claims 1-7.

11. A vector or host cell comprising the nucleic acid of claim 10.

12. A cell comprising an antibody that specifically binds to human PTK7, wherein the cell comprises one or more nucleic acids encoding:

(a) a light chain variable region set forth as SEQ ID NO: 62 and a heavy chain variable region set forth as SEQ ID NO: 63; or
(b) a light chain variable region set forth as SEQ ID NO: 64 and a heavy chain variable region set forth as SEQ ID NO: 65.

13. The antibody or antigen-binding fragment thereof of any one of claims 1-7 or the antibody conjugate of claim 8 for use as a pharmaceutical product.

14. The antibody or antigen-binding fragment thereof of any one of claims 1-7 for use in detecting, diagnosing, or monitoring a PTK7-associated disorder in a subject, wherein the PTK7-associated disorder is a proliferative disorder, which is optionally a neoplastic disorder comprising a solid tumor, such as breast cancer, ovarian cancer, colorectal cancer, pancreatic cancer, lung cancer, or skin cancer.

15. The antibody or antigen-binding fragment thereof of any one of claims 1-7 or the antibody conjugate of claim 8 for use in treating a PTK7-associated disorder, wherein the PTK7-associated disorder is a proliferative disorder, which is optionally a neoplastic disorder comprising a solid tumor, such as breast cancer, ovarian cancer, colorectal cancer, pancreatic cancer, lung cancer, or skin cancer.

16. The antibody or antigen-binding fragment thereof of any one of claims 1-7 or the antibody conjugate of claim 8 for use in reducing the frequency of tumor initiating cells in a subject.

17. The antibody or antigen-binding fragment thereof of any one of claims 1-7 for use in an *in vivo* method of detecting, diagnosing, or monitoring a PTK7-associated disorder in a subject, wherein the PTK7-associated disorder is a proliferative disorder, which is optionally a neoplastic disorder comprising a solid tumor, such as breast cancer, ovarian cancer, colorectal cancer, pancreatic cancer, lung cancer, or skin cancer.

18. An *in vitro* method of detecting, diagnosing, or monitoring a PTK7-associated disorder using the antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the PTK7-associated disorder is a proliferative disorder, which is optionally a neoplastic disorder comprising a solid tumor, such as breast cancer, ovarian cancer, colorectal cancer, pancreatic cancer, lung cancer, or skin cancer.

19. The antibody or antigen-binding fragment thereof for use according to any one of claims 14-15 or 17 or the antibody conjugate for use according to claim 15 or the method of claim 18, wherein the PTK7-associated disorder is cancer.