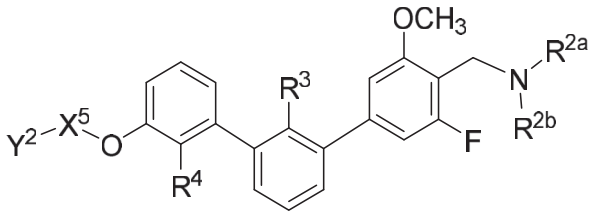
CLAIMS:

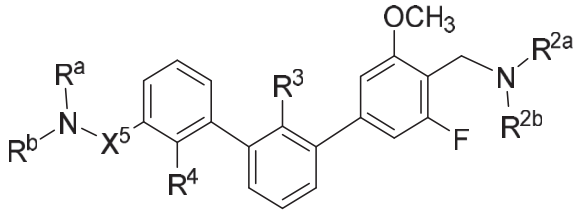
1. A compound having the formula:

(Ib):



(Ib) or

(Ic):



(Ic),

or a pharmaceutically acceptable salt thereof, wherein:

R^{2a} and R^{2b} are each independently selected from the group consisting of H, C_{1-8} alkyl, C_{1-8} haloalkyl, -Y, $-X^2-C(O)_2R^a$, $-X^2-OR^a$, $-X^2-NR^aR^b$, $-X^2-CONR^aR^b$, $-X^2-SO_2R^a$, $-X^2-SO_2NR^aR^b$, $-X^2-SO_3R^a$, and $-X^2-Y$, wherein each X^2 is C_{1-6} alkylene, and and any C_{1-8} alkyl or C_{1-6} alkylene is optionally further substituted with one or two members independently selected from OH, SO_2NH_2, $CONH_2$, C(O)NHOH, PO_3H_2, COO-C_{1-8}alkyl, and CO_2H, and each Y is selected from the group consisting of C_{3-6} cycloalkyl, C_{4-8} heterocyclyl, and 5- to 6-membered heteroaryl, each of which is optionally further substituted with one to four substituents independently selected from the group consisting of oxo, OH, C_{1-4} alkyl, C_{1-4} haloalkyl, C_{1-4} hydroxyalkyl, C_{1-4} alkoxy, C_{1-4} haloalkoxy, C_{1-4} hydroxyalkoxy, SO_2NH_2, $CONH_2$, C(O)NHOH, PO_3H_2, COO-C_{1-8}alkyl, and CO_2H;

or R^{2a} and R^{2b} are combined to form a 4- to 8-membered ring or spirocyclic ring, optionally having one or two additional ring vertices selected from O, N, and S;

R^3 is selected from the group consisting of F, Cl, C_{1-3} alkyl, C_{1-3} alkoxy, C_{1-3} haloalkyl, C_{1-3} haloalkoxy, C_{2-3} alkenyl, and CN;

the subscript n is 0;

R^4 is selected from the group consisting of H, halogen, CN, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} hydroxyalkyl, $-Y^1$, $-X^4-C(O)_2R^a$, $-X^4-OR^a$, $-X^4-NR^aR^b$, $-X^4-CONR^aR^b$, $-X^4-SO_2R^a$, $-X^4-SO_2NR^aR^b$, $-X^4-SO_3R^a$, $-O-X^4-Y^1$, and $-X^4-Y^1$, wherein each X^4 is a bond or C_{1-6} alkylene and is optionally further substituted with OH, SO_2NH_2, $CONH_2$, C(O)NHOH, PO_3H_2, COO-C_{1-8}alkyl, or CO_2H, and each Y^1 is selected from the group consisting of C_{3-6} cycloalkyl, C_{4-8} heterocyclyl, and 5- to 6-membered heteroaryl, each of which is optionally further substituted with one to four substituents independently selected from the group consisting of oxo, OH, C_{1-4} alkyl, C_{1-4} haloalkyl, C_{1-4} hydroxyalkyl, C_{1-4} alkoxy, C_{1-4} haloalkoxy, C_{1-4} hydroxyalkoxy, SO_2NH_2, $CONH_2$, C(O)NHOH, PO_3H_2, COO-C_{1-8}alkyl, and CO_2H;

X^5 is a bond or C_{1-6} alkylene and is optionally further substituted with OH, SO_2NH_2, $CONH_2$, C(O)NHOH, PO_3H_2, COO-C_{1-8}alkyl, or CO_2H, and Y^2 is selected from the group consisting of C_{3-6} cycloalkyl, C_{4-8} heterocyclyl, C_{7-9} spiroheterocyclyl, and 5- to 6-membered heteroaryl, each of which is optionally further substituted with one to four substituents independently selected from the group consisting of oxo, halogen, OH, C_{1-4} alkyl, C_{1-4} haloalkyl, C_{1-4} hydroxyalkyl, C_{1-4} alkoxy, C_{1-4} haloalkoxy, C_{1-4} hydroxyalkoxy, SO_2NH_2, $CONH_2$, C(O)NHOH, PO_3H_2, COO-C_{1-8}alkyl, and CO_2H;

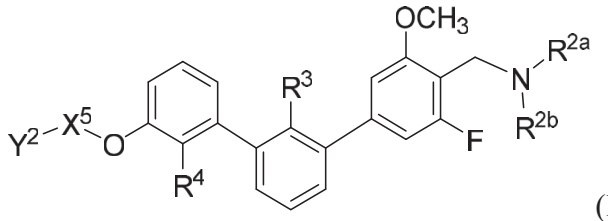
each R^a is independently selected from the group consisting of H, C_{1-6} alkyl, C_{3-6} cycloalkyl, C_{1-6} haloalkyl, C_{1-6} hydroxyalkyl, C_{1-6} alkylene-CO_2H, C_{1-6} alkylene-COO-C_{1-8}alkyl, and C_{1-6} alkylene-SO_3H;

each R^b is independently selected from the group consisting of H, C_{1-6} alkyl, C_{3-6} cycloalkyl, C_{1-6} haloalkyl, C_{1-6} hydroxyalkyl, C_{1-6} alkylene-CO_2H, C_{1-6} alkylene-SO_3H, and C_{1-6} alkylene-Y^3, wherein Y^3 is C_{3-6} cycloalkyl or C_{4-8} heterocyclyl, and each R^b is optionally further substituted with one or two members independently selected from oxo, OH, SO_2NH_2, $CONH_2$, C(O)NHOH, PO_3H_2, COO-C_{1-8}alkyl, and CO_2H; and

and R^a and R^b, when attached to the same nitrogen atom, are optionally combined to form a 4- to 8-membered ring or spirocyclic ring, optionally substituted with halogen, OH, SO_2NH_2, $CONH_2$, C(O)NHOH, PO_3H_2, COO-C_{1-8}alkyl, or CO_2H

.

2. The compound of claim **1**, or a pharmaceutically acceptable salt thereof, having the formula (Ib):



(Ib).

3. The compound of claim **1**, or a pharmaceutically acceptable salt thereof, wherein X^1 is $–CH_2-$.

4. The compound of claim **1**, or a pharmaceutically acceptable salt thereof, wherein R^3 is selected from the group consisting of F, Cl, CH_3, CF_3, and OCH_3.

5. The compound of claim **1**, or a pharmaceutically acceptable salt thereof, wherein R^4 is selected from the group consisting of F, Cl, CH_3, CF_3, and OCH_3.

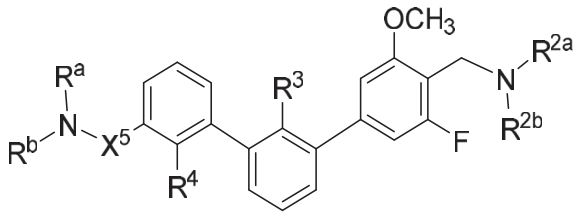
6. The compound of claim **1**, or a pharmaceutically acceptable salt thereof, wherein R^{2a} and R^{2b} are each H.

7. The compound of claim **1**, or a pharmaceutically acceptable salt thereof, wherein R^{2a} and R^{2b} are combined to form a 4- to 8-membered ring or spirocyclic ring, optionally having one or two additional ring vertices selected from O, N, and S; wherein said ring or spirocyclic ring is substituted with 0 to 4 substituents independently selected from the group consisting of oxo, $C_{1\text{-}8}$ alkyl, $C_{1\text{-}8}$ haloalkyl, $-X^3-C(O)_2R^a$, $-X^3-OR^a$, $-X^3-NR^aR^b$, $-X^3-CONR^aR^b$, $-X^3-SO_2R^a$, $-X^3-SO_2NR^aR^b$, and $–X^3-SO_3R^a$; wherein X^3 is a bond or $C_{1\text{-}6}$ alkylene.

8. The compound of claim **1,** or a pharmaceutically acceptable salt thereof, wherein R^{2a} is H or $C_{1\text{-}8}$ alkyl; and R^{2b} is –Y or $–X^1-Y$.

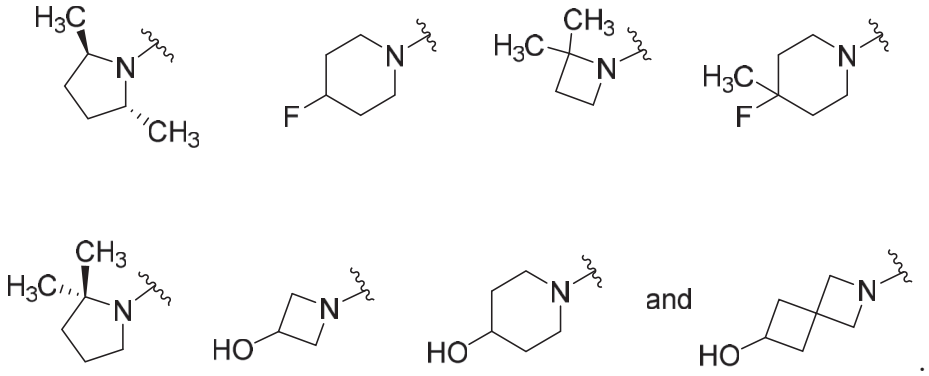
9. The compound of claim 8**,** or a pharmaceutically acceptable salt thereof, wherein Y is selected from the group consisting of C_{3-6} cycloalkyl and C_{4-8} heterocyclyl, each of which is optionally further substituted with one to four substituents independently selected from the group consisting of oxo, OH, C_{1-4} alkyl, C_{1-4} haloalkyl, C_{1-4} hydroxyalkyl, C_{1-4} alkoxy, C_{1-4} haloalkoxy, C_{1-4} hydroxyalkoxy, SO_2NH_2, $CONH_2$, C(O)NHOH, PO_3H_2, COO-C_{1-8}alkyl, and CO_2H.

10. The compound of claim **1,** or a pharmaceutically acceptable salt thereof, having the formula (Ic):



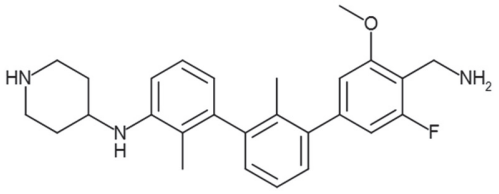
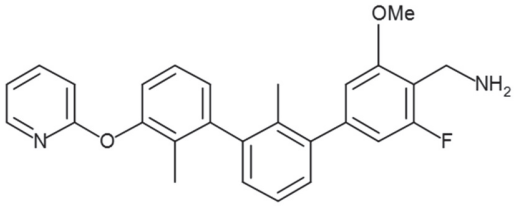
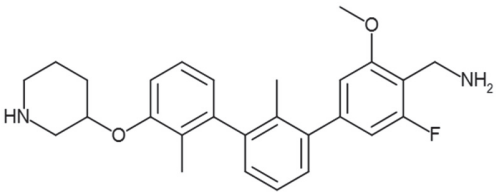
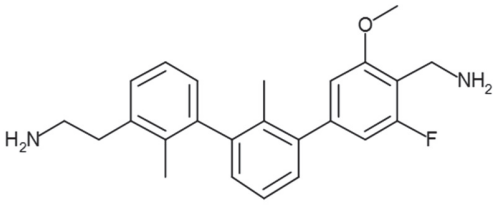
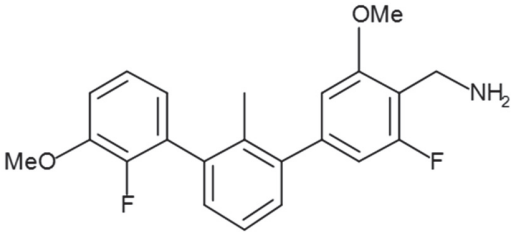
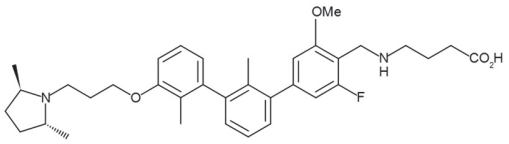
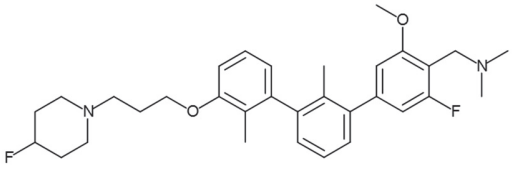
(Ic).

11. The compound of claim **1**, or a pharmaceutically acceptable salt thereof, wherein Y^2 is selected from the group consisting of:



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12. The compound of claim **1**, which is

Compd ID	Structure
1.003	
1.013	
1.014	
1.023	
1.031	
1.067	
1.078	

or a pharmaceutically acceptable salt thereof.

13. A pharmaceutical composition comprising a compound of any one of claims **1** to 12, or a pharmaceutically acceptable salt thereof, and a pharmaceutically acceptable excipient.

14. Use of a compound of any one of claims **1** to 12, or a pharmaceutically acceptable salt thereof, or a composition of claim 13, in the preparation of a medicament for inhibiting growth, proliferation, or metastasis of cancer cells in a subject.

15. Use of a compound of any one of claims **1** to 12, or a pharmaceutically acceptable salt thereof, or a composition of claim 13, in the preparation of a medicament for treating a subject suffering from or susceptible to a disease or disorder mediated by the PD-1 signaling pathway, wherein the disease or disorder is selected from the group consisting of melanoma, glioblastoma, esophagus tumor, nasopharyngeal carcinoma, uveal melanoma, lymphoma, lymphocytic lymphoma, primary CNS lymphoma, T-cell lymphoma, diffuse large B-cell lymphoma, primary mediastinal large B-cell lymphoma, prostate cancer, castration-resistant prostate cancer, chronic myelocytic leukemia, Kaposi's sarcoma fibrosarcoma, liposarcoma, chondrosarcoma, osteogenic sarcoma, angiosarcoma, lymphangiosarcoma, synovioma, meningioma, leiomyosarcoma, rhabdomyosarcoma, sarcoma of soft tissue, sarcoma, sepsis, biliary tumor, basal cell carcinoma, thymus neoplasm, cancer of the thyroid gland, cancer of the parathyroid gland, uterine cancer, cancer of the adrenal gland, liver infection, Merkel cell carcinoma, nerve tumor, follicle center lymphoma, colon cancer, Hodgkin's disease, non-Hodgkin's lymphoma, leukemia, chronic or acute leukemias, acute myeloid leukemia, chronic myeloid leukemia, acute lymphoblastic leukemia, chronic lymphocytic leukemia, multiple myeloma, ovary tumor, myelodysplastic syndrome, cutaneous or intraocular malignant melanoma, renal cell carcinoma, small-cell lung cancer, lung cancer, mesothelioma, breast cancer, squamous non-small cell lung cancer (SCLC), non-squamous NSCLC, colorectal cancer, ovarian cancer, gastric cancer, hepatocellular carcinoma, pancreatic carcinoma, pancreatic cancer, pancreatic ductal adenocarcinoma, squamous cell carcinoma of the head and neck, cancer of the head or neck, gastrointestinal tract, stomach cancer, HIV, Hepatitis A, Hepatitis B, Hepatitis C, Hepatitis D, herpes viruses, papillomaviruses, influenza, bone cancer, skin cancer,

rectal cancer, cancer of the anal region, testicular cancer, carcinoma of the fallopian tubes, carcinoma of the endometrium, carcinoma of the cervix, carcinoma of the vagina, carcinoma of the vulva, cancer of the esophagus, cancer of the small intestine, cancer of the endocrine system, cancer of the urethra, cancer of the penis, cancer of the bladder, cancer of the kidney, cancer of the ureter, carcinoma of the renal pelvis, neoplasm of the central nervous system (CNS), tumor angiogenesis, spinal axis tumor, brain stem glioma, pituitary adenoma, epidermoid cancer, abestosis, carcinoma, adenocarcinoma, papillary carcinoma, cystadenocarcinoma, bronchogenic carcinoma, renal cell carcinoma, transitional cell carcinoma, choriocarcinoma, seminoma, embryonal carcinoma, Wilms tumor, pleomorphic adenoma, liver cell papilloma, renal tubular adenoma, cystadenoma, papilloma, adenoma, leiomyoma, rhabdomyoma, hemangioma, lymphangioma, osteoma, chondroma, lipoma, and fibroma.

16. The use of claim 14, wherein the subject suffers from a disease or disorder selected from the group consisting of an infectious disease, a bacterial infectious disease, a viral infectious disease, a fungal infectious disease, a solid tumor, a hematological malignancy, an immune disorder, an inflammatory disease, and cancer.